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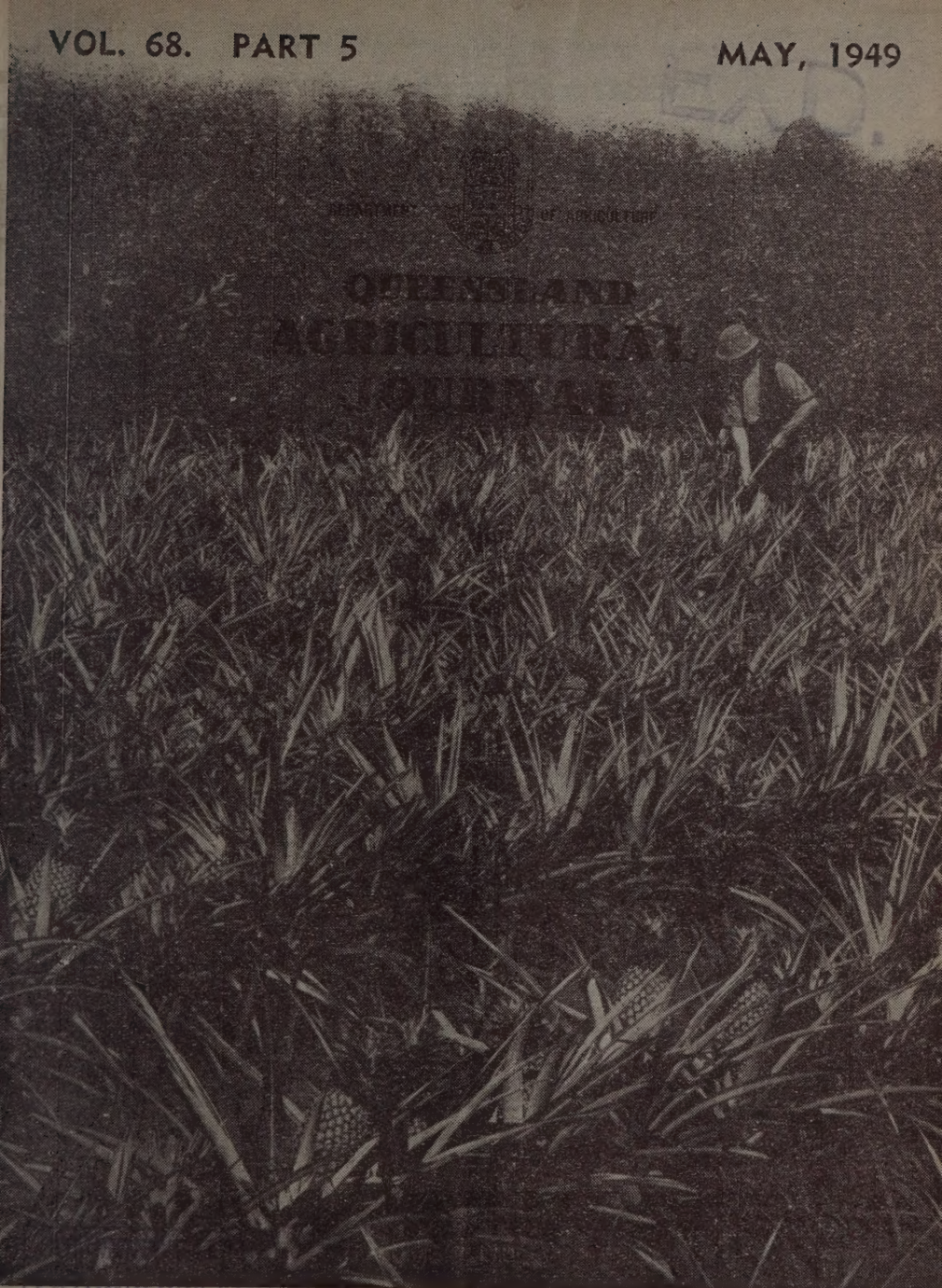

QUEENSLAND AGRICULTURAL JOURNAL

In a Pineapple Plantation, Southern Queensland.

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Contents

A Home-made Bulldozer.

H. BIRD,* Tingoora.

IN soil conservation work on my farm, I have used a farm-built bulldozer attachment on a Farmall M tractor and am satisfied that, with minor variations, the attachment would be suitable for other universal-type tractors, though a narrower blade would naturally be used with tractors of lower horsepower. The total cost of the attachment was £35, including purchase of iron and timber, curving of iron, welding and labour.

Plates 138-140 and the drawings show all necessary details. Briefly, the set-up may be described as follows: The transmission of a car differential is attached to the tractor power take-off. One side of the differential housing is shortened by cutting and welding, and a drum is welded to the original wheel base. A hand lever connected to the brake drums permits the brake to be released or applied on either side as required. The drum turns when the brake is applied to the opposite wheel base. A wire rope attached to the drum and operating through pulleys elevates the bulldozer blade to any height required, while release of this lifting impulse permits lowering of the blade to ground level.

More recently, following the fitting of an hydraulic pump, I have replaced the winding drum lifting mechanism with an hydraulic ram, which can be made in a garage workshop. Plate 141 shows the new arrangement, and Plates 142 and 143 the new bulldozer in operation.

* Mr. Bird is a South Burnett farmer. He has furnished these notes on a bulldozer attachment of his own manufacture at the request of Mr. J. A. Kerr, a Departmental Officer stationed at Kingaroy. The drawings are by Mr. W. Manley from sketches prepared by Mr. Harry W. Miller, who is employed on Mr. Bird's property.—Editor.

Jobs Completed.

Work which I have carried out on my property with the bulldozer includes the following:—

1. Filling in gullies up to 7 feet deep and 8 feet wide in cultivation areas.
2. Levelling off high spots in the fields after filling gullies—this operation was done in three sections:—
   (*a*) Skimming surface soil to one side;
   (*b*) Levelling the subsoil;
   (*c*) Returning and spreading the surface soil.
3. Assisting the construction of broad-base contour banks, particularly in portions where the volume of surface soil has been considerably reduced by erosion.
4. Correcting faults in contour bank construction, involving moving portions of banks either up or down the slope and cleaning outlets, &c.
5. Erecting banks to divert water from cultivated fields. (Plates 142 and 143.)
6. Excavating water channels to remove excess water discharged from broad-base contour banks.

Limitations of the Outfit.

This bulldozer is not suitable for removing big timber, nor for shifting soil on hard, unploughed country. However, in addition to the uses listed above, it should be handy for many other jobs around farms.

Plate 138.
FRONT AND SIDE VIEW OF THE ORIGINAL MODEL BULLDOZER.

Plate 139.
GENERAL VIEW OF THE ORIGINAL MODEL BULLDOZER.

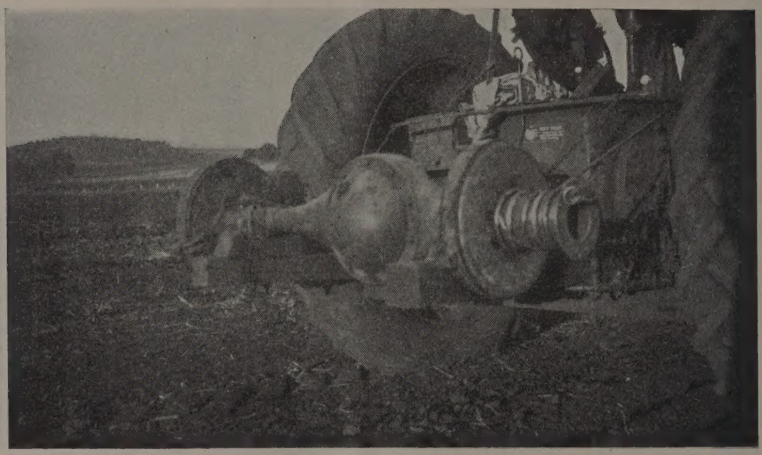

Plate 140.
A CLOSE VIEW OF THE WINDING DRUM LIFT OF THE ORIGINAL MODEL.

Plate 141.
SIDE VIEW OF THE IMPROVED MODEL, SHOWING THE HYDRAULIC RAM.

Plate 142.
THE IMPROVED MODEL BULLDOZER SHIFTING EARTH TO MAKE A CONTOUR BANK.

Plate 143.
SHOWING THE DOZER BLADE LIFTED.

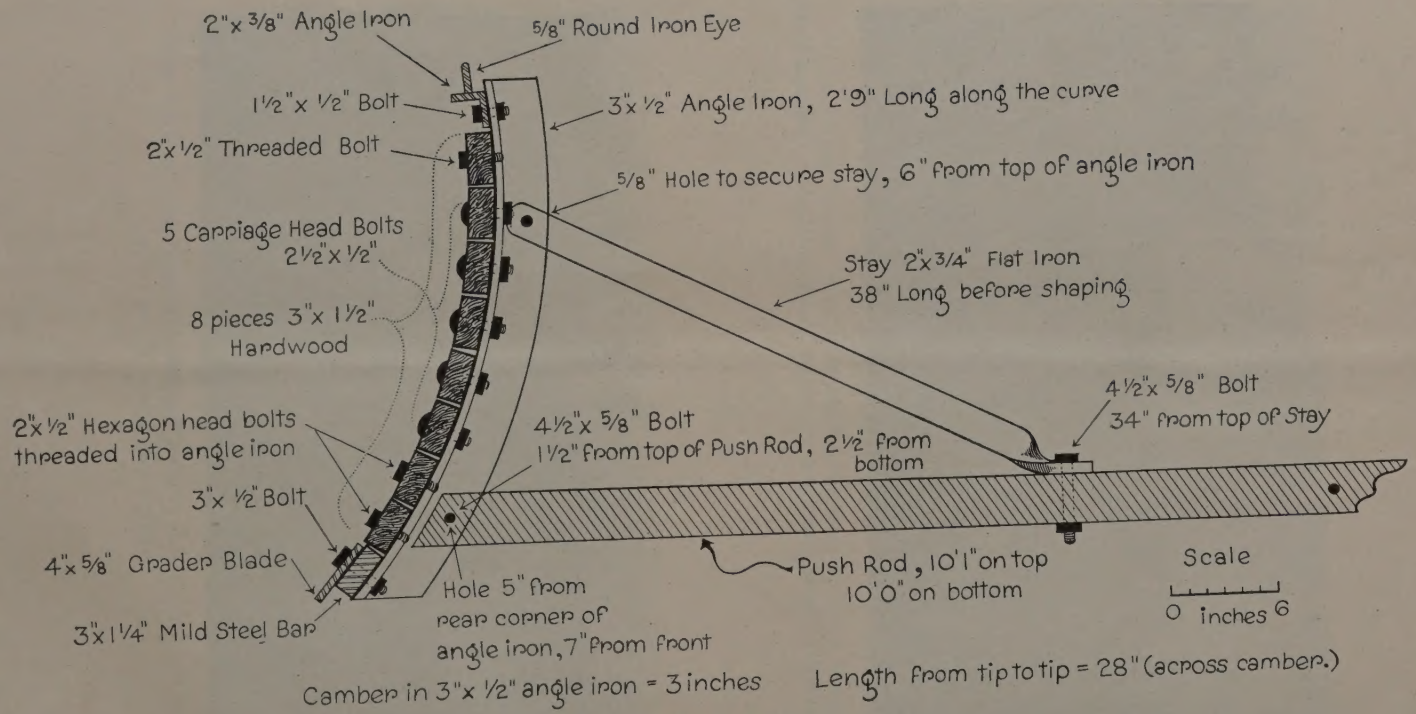

Plate 144.

SIDE ELEVATION OF THE DOZER BLADE.

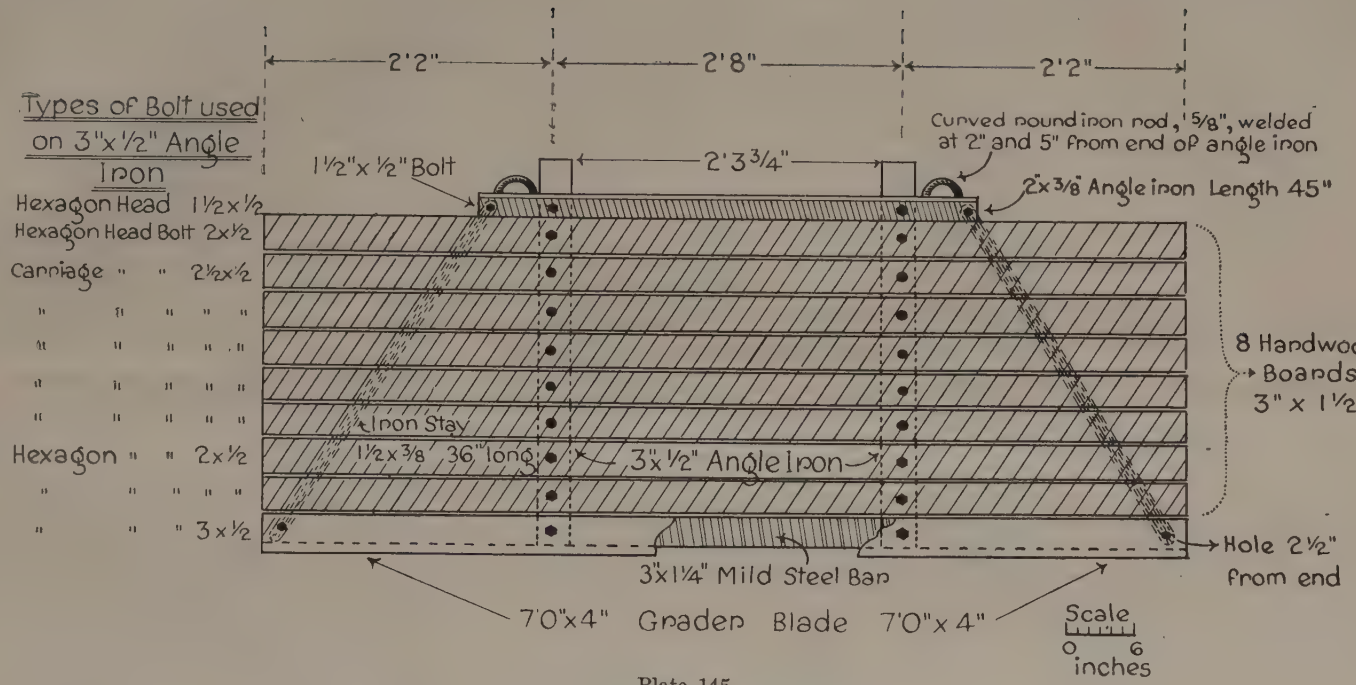

Plate 145.

FRONT ELEVATION OF THE DOZER BLADE.

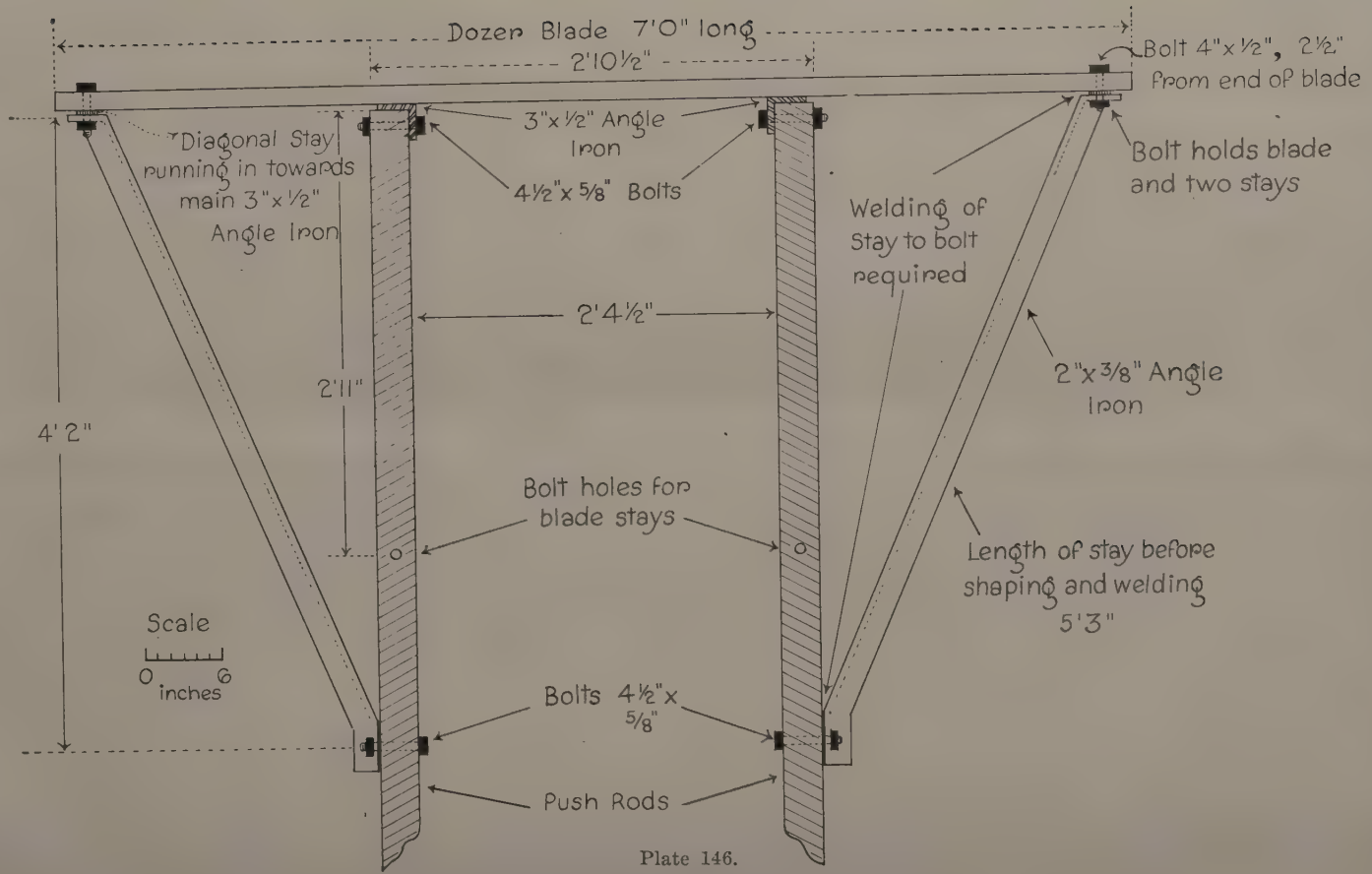

Plate 146.
DIAGRAM OF MOUNTING OF BLADE TO PUSH RODS.

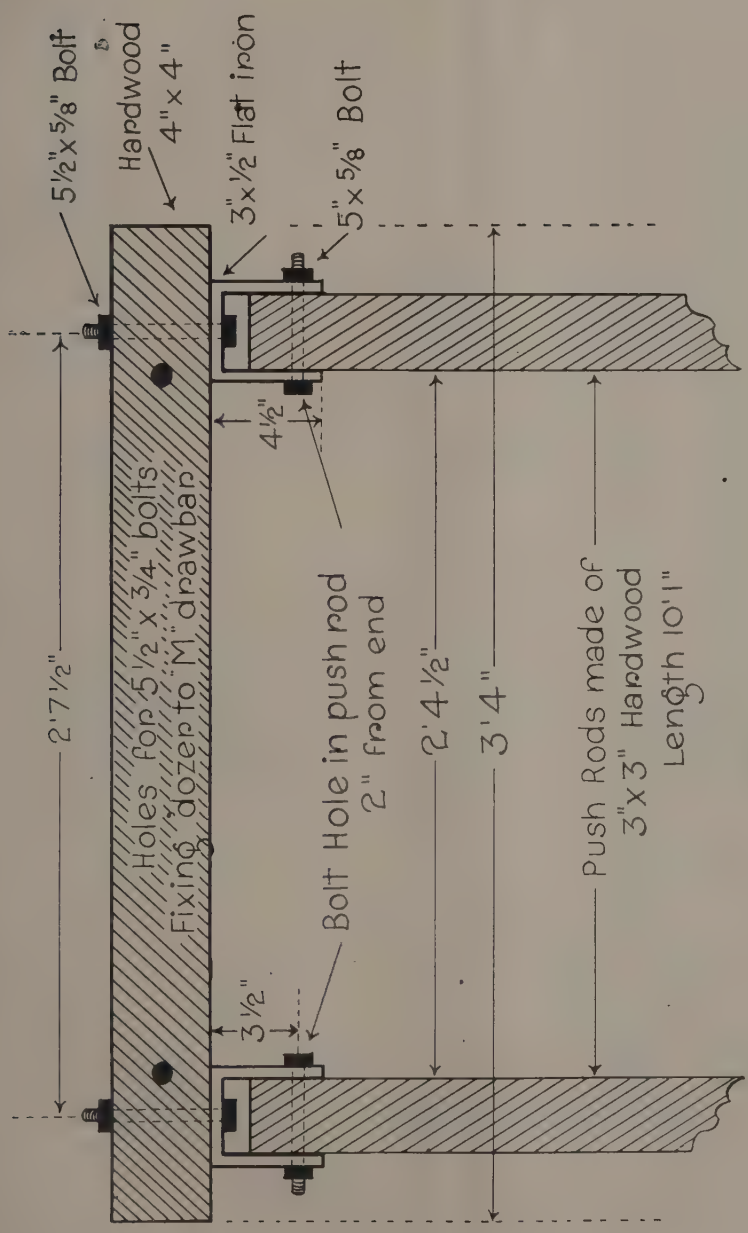

Plate 147.

Diagram of Mounting of Blade to Tractor Drawbar.

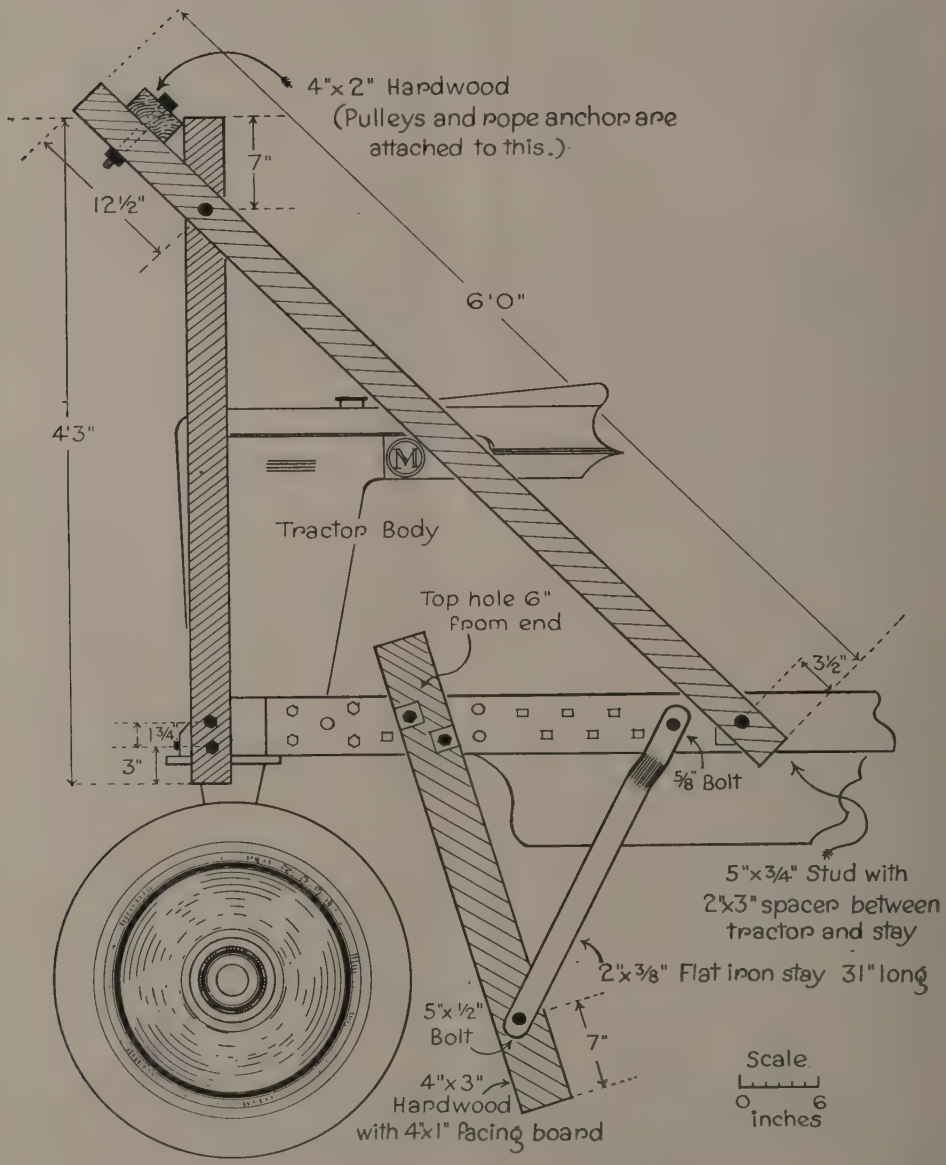

Plate 148.

DIAGRAM SHOWING DERRICK AND GUIDE ARMS FOR PUSH RODS (ORIGINAL MODEL).

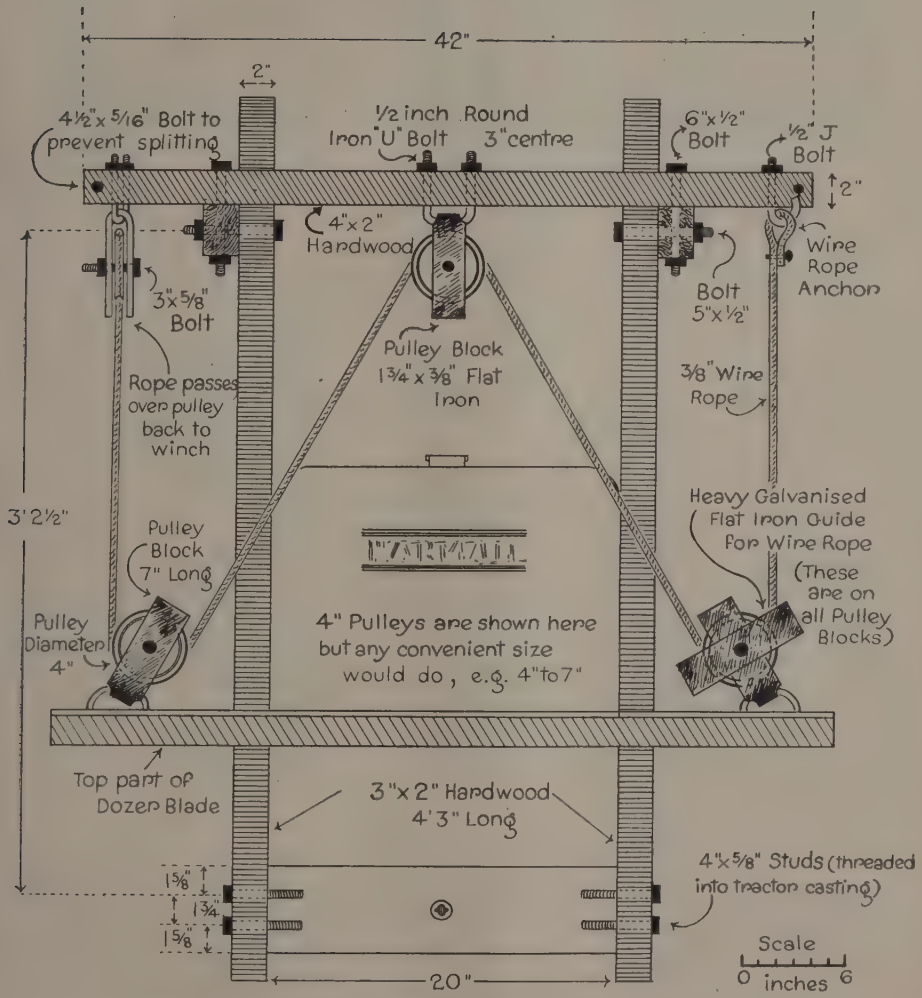

Plate 149.

Diagram Showing Derrick With Pulleys in Position (Original Model).

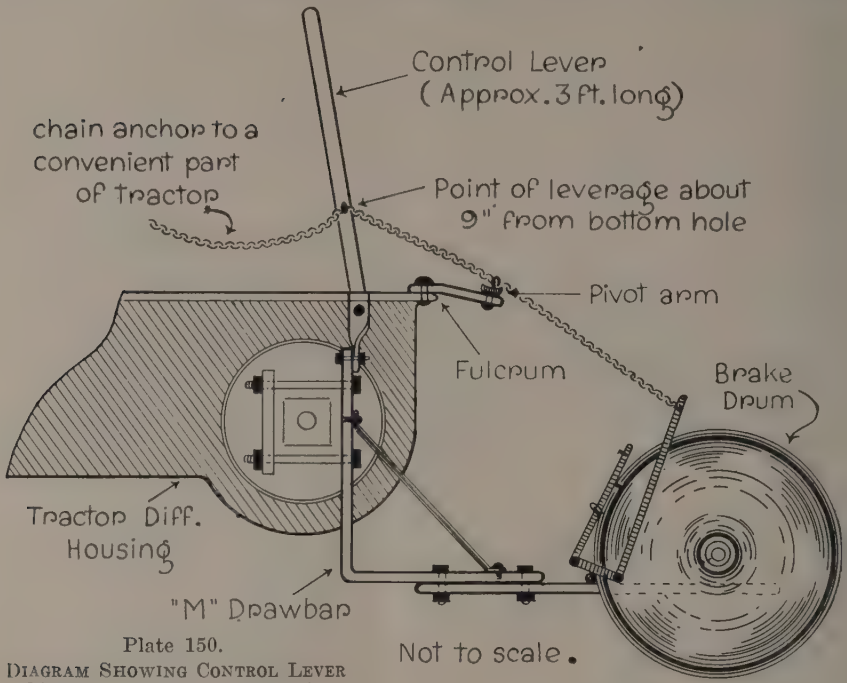

Plate 150.
DIAGRAM SHOWING CONTROL LEVER MOUNTING (ORIGINAL MODEL).

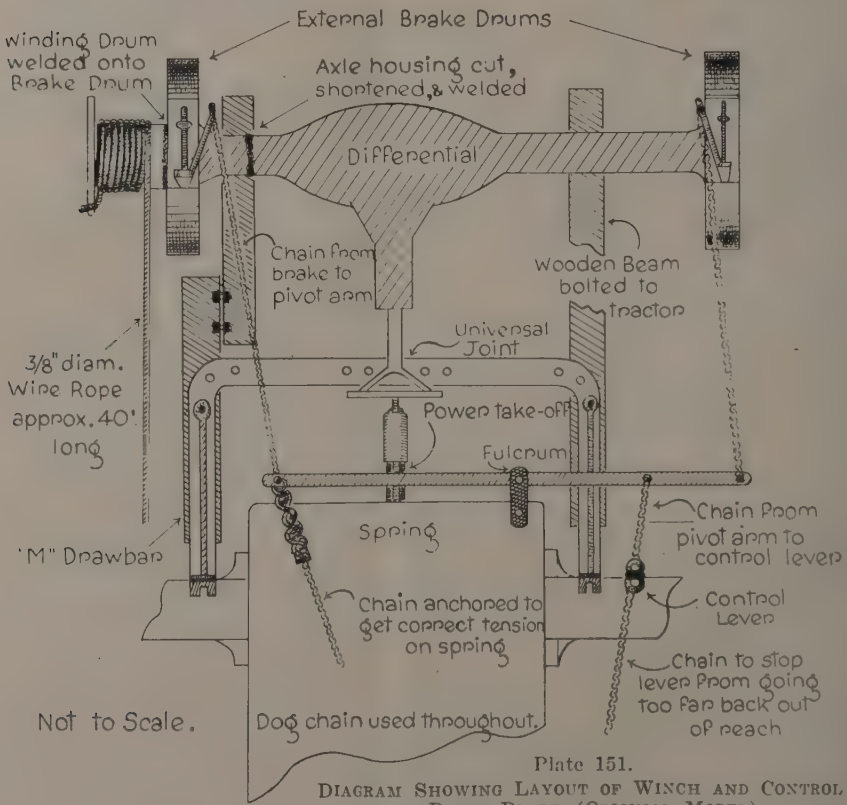

Plate 151.
DIAGRAM SHOWING LAYOUT OF WINCH AND CONTROL OF DOZER BLADE (ORIGINAL MODEL).

Bean Growing in the Gympie District.

K. D. HOFFMANN.*

UNTIL 1935, bean production on a commercial scale was of minor importance in the Gympie district. A sudden drop in banana prices occurred about that time and growers were faced with the urgent necessity of finding an alternative crop for land for which high prices had been paid and which was either too steep or of insufficient acreage for dairying purposes. The demand by southern States for French beans during the winter months, and the suitability of the district for the growing of the crop at that time of the year, combined to establish beans as a vegetable crop of major importance.

In the early years of large-scale bean growing, farmers were beset with a number of problems. Production was seriously hampered by the ravages of bean fly, which made all but late autumn to spring plantings hazardous. Satisfactory control measures for this pest, which are now widely used, had not been worked out at that time. There was little information available on correct fertilizing practice, and the performance of different varieties was almost an unknown factor. However, in spite of these and other difficulties, the industry has steadily expanded and a high standard of efficiency has been attained. Record production figures were established in 1945 when the Gympie district, including Cooroy and the Mary Valley, marketed approximately 160,000 bushels.

CHOICE OF SITE.

Freedom from Frost.

The bean plant is readily damaged by frost and this fact must be borne in mind when the bean-growing area is being chosen. While a heavy frost completely destroys a crop, even a light one can do sufficient harm to cause an economic failure. Of paramount importance, therefore, is freedom of the area from the possibility of damage from what would be considered only light frosts. For this reason, all winter cultivation of beans is confined to hillsides.

Protection from Wind.

Protection, especially from westerly and southerly winds, is almost a necessity for the area under crop and is certainly a sound precaution. Boisterous winds may cause direct injury to the plants,

* Formerly Adviser in Horticulture.

such as breaking and twisting of the branches or even breaking of the bush itself. Scorching of the leaves, especially by westerly winds, stunting of growth and dropping of the flowers are also associated with exposure to strong cold winds. In addition, the drying effect of such winds on the soil may be very considerable.

The protection given to a crop by a natural timber windbreak is excellent. However, as the maximum amount of sunlight must reach the cultivation, the amount of timber left on the eastern, northern and western sides of the area should not be excessive.

Protection for small areas can be provided readily by growing windbreaks of cow cane, spaced at appropriate intervals through the crop. As a rule, the cane is planted two or three rows to a break and the distance between breaks varies from about one-and-a-half to two chains.

Aspect.

Easterly and northerly slopes are preferred for bean growing. They receive the maximum number of hours of sunlight and hence are appreciably warmer than southerly and westerly slopes. As a result, the length of time from planting to harvesting may be three or four weeks less than in the case of cold slopes. Easterly and northerly slopes also enjoy a certain degree of natural protection from cold westerly and southerly winds, whilst crops grown on them are less subject to disease, especially in wet winters.

Water Supply.

Suitable water in sufficient quantities for irrigation purposes is a major asset. Frequently, during the winter months a dry period is experienced at what might be a critical stage in the growth of the crop. Plants may be stunted, flowering spoilt, or the filling out of pods delayed by lack of an inch of rain and the result is a poor crop. A water supply capable of yielding an acre-inch each week may be considered sufficient to save the situation. This represents approximately 22,000 gallons per acre per week.

It is advisable to submit a sample of the water to the Department of Agriculture and Stock for analysis to determine its suitability for irrigation purposes before any outlay is made on irrigation plant.

Soil.

Since beans are a short-term crop, good soil conditions must be provided prior to planting. Drainage must be adequate to cope with heavy rains. Waterlogging is followed by stunting and yellowing of the plants which, in turn, is accompanied by reduced yields, and if it is prolonged the plants may die. A depth of 12 inches of well-drained soil can be considered suitable for cultivation. Loams, whether of a sandy or moderately clayey nature, combining good drainage with a capacity to hold moisture, are the best bean soils.

PREPARATION OF THE LAND.

The aims of soil preparation are the building up of humus supplies in the soil by the turning in of green crops, the establishment of a friable textured soil through which water penetrates freely and in which root growth is facilitated, and the control of weeds.

Cultivation to a depth of 8 or 10 inches provides ample room for root development of the bean plant as well as a high capacity for absorbing and retaining moisture. Two or three ploughings, or a rotary hoeing followed by ploughings, are advisable. The land should then be harrowed down, the surface being left even and free from clods. Whether the crop is to be grown in late summer, autumn or winter, early preparation of the soil is essential and this should commence at least six to eight weeks prior to planting. A longer period may be advisable where a tough fibrous cover crop has been grown.

The burning of weeds and grass each year is a short-sighted policy and is to be avoided. Poor soil conditions, both physical and chemical, are the final result. The rotary hoe or cut-away disc cultivator provides a means of handling almost any cover crop or weed growth, but these crops are often turned in by the plough. Whatever the cover crop may be, it must be incorporated in the soil in time to allow soil organisms to break it down before the beans are planted. Planting the seed before the rotting process is complete results in competition between the soil organisms and the bean plant for the available nitrogen. Such competition causes the crop plant to be starved of this essential plant food.

If lime is used it should be applied soon after turning in the cover crop. By doing so, rotting of the green manure is hastened and subsequent cultivation ensures the thorough incorporation of the lime in the soil. One ton of burnt lime per acre is considered a reasonable application for bean soils in the district.

Precautions Against Erosion.

Most of the areas producing beans during the winter months are, as stated previously, situated on hillsides and preparation for the early crops coincides with the wet season. The danger of severe erosion is therefore very great where little or no cover crop is being turned in. Bulky vegetation has a binding effect on the surface soil, reduces the danger of wash, and ensures effective water absorption.

Should the area to be planted be in the path of water running off land further up the slope, diversion drains should be provided on the uphill side of this area. Where such action is not practicable, the run-off from outside areas must be conducted via waterways, which, if not securely reinforced with rock, must be left uncultivated, or, better still, grassed. In this way, scouring is prevented and the possibility of damage to both soil and crop is minimised.

Surface drainage to check sheet erosion is easily provided by opening drains across the direction of the flow of water. Steepness of slope and texture of soil should be considered when deciding on the distance between drains, but, on the average, a chain should suffice. A fall in each drain sufficient to ensure the flow of water is all that is necessary. Cross drains must be large enough to cope with a heavy run-off, as the failure of those higher up the slope will almost inevitably cause the breakdown of the drainage system below them.

Where a considerable area of land is to be brought under cultivation, a sound practice is to plough chain-wide strips across the slope, alternating with chain-wide strips of a standing cover crop. By this method, half the area can be prepared for early crops and at no time during heavy rains is an extensive area exposed to the risk of erosion.

Cultivation on the contour is most convenient for horse-drawn implements, whether the disc or mouldboard plough be used. Wheeled tractors handle contour cultivation on moderate slopes. On steeper slopes, wheel spin on the uphill side and crabbing become problems and there is always the risk that the machine will overturn. Under these circumstances, contour cultivation with horses is preferable to cultivation down the slope with a wheeled tractor, even if the size of the area has to be appreciably reduced. Downhill cultivation of land, especially at a time coinciding with heavy rains, is a practice to be avoided. The downward movement of soil is hastened by run-off water which quickly gathers momentum in the furrows. Loss of most of the soil to the depth cultivated is usually the final result.

VARIETIES.

The dwarf French bean varieties are grown exclusively and by far the most popular of these is the Brown Beauty. For productiveness and popular demand, it has long enjoyed first place. Although by no means disease resistant, it seems less susceptible than some of the other varieties to rots affecting the pods. Staley's Surprise gives good results in warmer months. Growth at that time is vigorous and the larger bushes carry the typically long pods without allowing them to brush the ground. Later plantings suffer severely from pod rots. The various Wonder varieties give excellent results as far as cropping is concerned. Their greatest drawback is a tendency to become somewhat unattractive after transport to southern markets. Feltham's Prolific is not a satisfactory market variety because of its small pod. The St. Andrew's variety still has a few supporters among growers but it is not extensively grown.

TIME OF PLANTING.

The bean crop in coastal areas is essentially a winter one. Where there is no risk of frost, the plants will grow at any time of the year, but in the hottest months the production of a good quality article is seldom possible. In summer, too, the market is usually well supplied with beans from the highland areas where production is comparatively easy at that time of the year. Consequently, planting in the Gympie and other coastal districts commences in March, or sometimes as early as February, and is carried on through the winter until about August. The main planting months are April, May and June.

Where the lower portions of a cultivation are likely to be frosted, they should be planted early. In this way, the crop is harvested before there is any serious danger of frost. Later plantings are then made at higher, safer levels.

The crop grows and matures quickly and the period during which the pods are in the best condition for picking is short. For this reason, it is advisable to plant small areas at regular intervals about a fortnight apart; then the different areas will carry their heaviest crops at different periods, thus enabling picking to be more easily handled. In addition, the market can absorb regular moderate supplies more easily.

FERTILIZING PRACTICE.

Experimental work has shown that in many coastal soils a planting mixture for beans should contain nitrogen and phosphoric acid in the proportion of 1 to 3 or 4. Potash requirements are somewhat obscure,

but a mixture containing 2 per cent. is satisfactory under many conditions; higher percentages of potash have actually shown a tendency to depress yields. A very suitable mixture for use at planting time is thus one having an analysis of 4 : 15 : 2—that is, 4 per cent. nitrogen, 15 per cent. phosphoric acid, and 2 per cent. potash. The nitrogen is best provided in the form of sulphate of ammonia as it readily becomes available to the plants, and phosphoric acid requirements are best supplied in the form of water-soluble superphosphate.

Fertilizer placement experiments have shown that good results are obtained when the fertilizer is placed in a band about six inches wide and two inches below the seed. When planting by hand is practised a furrow is usually opened to a depth of about six inches and the fertilizer is applied in the furrow and covered with approximately two inches of soil. The covering may be done with a scuffler, if conditions permit, but on steeper areas the job is one for a chip hoe or rake.

Planting machines, with fertilizer attachment, perform the operations of laying the fertilizer and planting the seed, and satisfactory results are to be expected when these machines place the fertilizer in a band below the seed.

This initial dressing of fertilizer should consist of a 4 : 15 : 2 or some similar mixture, applied at a rate of from 6 to 10 cwt. per acre. Subsequent fertilizing takes the form of a side-dressing with sulphate of ammonia at the rate of 1 cwt. per acre. This is spread in a narrow band a few inches from the plant, preferably on the top side, usually when the plants are about a fortnight old.

For guidance in judging the quantity of mixture to apply in the furrows, the following information may be useful:—

An application of ½ lb. of fertilizer per chain gives a rate of—

165 lb. per acre when rows are 2 feet apart;

132 lb. per acre when rows are 2 feet 6 inches apart;

110 lb. per acre when rows are 3 feet apart.

LAYOUT.

The rows may be planted on contour lines or up and down hill. Contour planting is preferable and more convenient under most conditions; planting across the slope is the method most commonly used.

Under some conditions, particularly on steep slopes, the rows may be run up and down hill, largely for convenience of working. In such cases, the precautions concerning water run-off stressed earlier must be carefully observed.

ROW SPACING AND PLANTING.

Row spacing varies from two feet to two feet six inches. During the warmer months, when growth is vigorous, the wider spacing allows room to work along the rows at picking time without damaging the bushes. During the cooler weather, the two-feet spacing can be quite conveniently used.

Seeds are usually spaced about four to six inches apart; but at times, to increase protection from wind, double planting (that is, two seeds together, eight inches apart) gives satisfactory results. Mechanical

planters are, of course, normally designed to drop seeds singly. Whether planted by hand or by machine, the seed should be covered by one to two inches of soil.

The seeding rate per acre varies from 35 to 50 lb.

For hand planting, only a few drills should be opened up at a time. The seeds should be dropped without delay and then covered immediately. In this way, the soil in the furrows is not allowed to dry out to any extent and so a better germination is likely to result. However, obviously the importance of this practice is diminished where irrigation is used.

CULTIVATION.

Cultivation of the crop has, as its aims, firstly, hilling up soil to the plants; secondly, weed control; and thirdly, conservation of moisture.

Hilling-up is done to provide additional mechanical support for the plant and also to assist it to withstand bean fly attack. The larvae of this insect tunnel down the stems to ground level, where many of them complete their life cycle. The effect is to weaken the stem seriously and reduce the food supply from the roots. Hilling-up the soil around the stems induces the formation of a higher, secondary root system which partly offsets the damage, though the main control of this pest is provided by sprays.

Usually the drill in which the seed is planted is not completely filled in. When the young plant is putting out its second leaves and has attained a height of four to six inches, the first hilling is done by breaking down the remainder of the furrow. This operation is generally done with a hoe, but on level or nearly level ground scufflers may be fitted with hillers and the job done by horse power. Depending on the vigour of the bean plants, amount of weak growth and other factors, a second and even third hilling may be needed at intervals of one to two weeks.

As weed control and soil moisture conservation go hand in hand, chipping and scuffling achieve a twofold objective. Scuffling can be done during the early stages of the plant's life on gradual slopes but its use is limited to inter-row spaces. Weeds in the rows must be cut out with the hoe while any cultivation deemed necessary after the plants are well grown must also be done with this implement. On steep slopes all cultivation is, of course, done by hand.

A recent development has been the use of a three-pronged raking implement to loosen the surface soil round the plants and to destroy weeds two or three times during their life. Substantial increases in yield have been claimed for this treatment, though experimental evidence in support of this claim is lacking.

IRRIGATION.

Where water is available in sufficient quantities and the weather is dry, an application of up to three inches about five to seven days prior to planting may be used. This encourages germination of weed seeds and then a light harrowing or rotary hoeing, just before planting,

is sufficient to destroy the young weeds. Planting should follow immediately after the harrowing before the soil has dried out any further.

Plate 152.
HARVESTING FRENCH BEANS ON THE NORTH COAST.

If the first watering is given after planting, it should be made as soon as possible after the closing of the furrows. Subsequently, irrigation should be used to supplement natural rainfall as required, and in sufficient amounts to ensure rapid and uninterrupted growth of the plants. A bean crop requires one-half to one inch of water (natural or applied) each week.

At flowering time, should the weather be dry, a watering of up to two inches should be given. The production of fleshy, crisp pods is dependent on sufficient moisture being available from this time onwards.

A sound plan is to water two or three days prior to the first picking. This will finish off plant development, make the pods attractive and at the same time allow the ground to dry off to some extent before the pickers have to move about on it.

HARVESTING.

During the warmer weather, picking (Plate 152) may commence eight or nine weeks after planting; but in the winter, especially on cold slopes, up to 15 weeks may elapse before the first beans are ready.

In order to market a high quality pack, careful attention must be paid to harvesting and packing. The crop must be picked at the right stage and this can be determined largely by the size of seed. When the seed of Brown Beauty and similar varieties has attained a length of about one-quarter of an inch, the pod is considered to be of a suitable size for picking. Where picking is delayed, seed development takes place at the expense of the flesh of the pods. The result is that appearance and crispness deteriorate and the beans lose their smooth outline. These faults develop particularly rapidly if the plants lack moisture during a warm spell.

Kerosene tins are very suitable for use in harvesting. They are easy to handle as the picker advances along the row and they hold a convenient quantity of beans. The usual practice is to empty each tin of beans into a sack or other suitable container, which should always be kept in a cool, shady place. When the sack is full, or perhaps sooner, the beans should be tipped on to the packing bench and spread out in a thin layer to cool and thoroughly dry before packing.

Care must be taken to ensure that the minimum amount of damage is done to the bushes, particularly in the early pickings; otherwise the latter portion of the crop will suffer.

The first picking is not usually heavy, as only the few forward pods which are formed from the early flowers are ready. Second, third and fourth pickings account for the greater part of the crop. Market prices determine the number of further pickings but five or six at intervals of three to five days are usual.

Yields vary considerably, but an average of 100 cases (1½ bushel) per acre is grown regularly by many good bean growers, who, from some patches, would obtain much higher yields. However, an overall average for the district would probably be in the vicinity of 60 cases per acre.

PACKING.

Before packing the beans, the case should be weighed and the weight plainly marked or stencilled on the case. If the cases are made soon after receiving the timber and then stored for some days prior to packing, drying of the timber takes place and case weight decreases. For this reason it is wise to weigh just prior to packing and to mark on the case the weight to the nearest pound above the reading.

The agent's name, address, and number as well as the grower's name and address should be neatly stencilled on the ends of the case or in a prominent position on the bag, whichever is being used.

The most common method of packing in cases is to lay the beans across the case in handfuls, keeping the pack firm as height is built up. A bulge of from one to two inches allows for shrinkage in transport and still keeps the pack firm throughout. For the southern market, the one-and-a-half bushel case is used. The average weight of beans in this case is 65 lb.

Special bean bags or sugar bags holding approximately 35 to 40 lb. are used for local markets.

When packed, the cases or bags should be stacked in a cool position. Cases must be stacked on their sides; in fact, the bulge of the lids prevents any other action. Bags must be stacked only in small stacks, otherwise the lower bags are crushed by the weight.

During transport to rail the cases or bags should be sheltered from the sun and rain to ensure marketing of a high quality article.

PESTS AND DISEASES.

There are several serious pests of beans, and of these the bean fly is of outstanding importance. If efficient control measures are not applied, this one insect pest alone can markedly limit bean production as soon as warm weather commences, and in the later summer months it can completely destroy the crop. It may even cause severe losses during a mild winter. Other pests that may adversely affect the bean plant include aphids, flower caterpillars, pod borers, bean thrips, red spider, and the green vegetable bug.

The outstanding diseases of beans are halo blight, anthracnose, and "nestiness." The first two diseases mentioned are seed-borne. Consequently every effort should be made to purchase certified seed and so prevent their establishment in a planting.

Further information concerning bean pests and diseases is available in publications issued by the Science Branch of the Department of Agriculture and Stock.

USE OF GREEN CROPS.

The soil can be kept in a condition suitable for bean growing only by satisfactory soil management practices, and this involves the protection of the soil against erosion and from the heat of the sun, and the incorporation in it of considerable quantities of humus-forming materials. As a general rule, this means the growing of green crops in rotation with the beans.

A useful rotation is provided by weeds and grasses common during summer months on most bean lands. Red Natal grass, summer grass, crowsfoot grass, stinking Roger, and thistles, all contribute to making an appreciable tonnage of green matter per acre. However, they do tend to aggravate the weed position in subsequent bean plantings, and consequently the planting of one of the well-known cover-crop species should be favoured.

Poona pea gives satisfactory results. The crop provides good protection against erosion, and when sown at the rate of 50 to 60 lb. of seed per acre a good tonnage of green matter for incorporation in the soil is usually obtained. In addition, fixation of nitrogen makes the soil richer in this plant food. When sowing on the land for the

first time, inoculation of the seed with the appropriate bacterial culture is advisable. These cultures are available from the Department of Agriculture and Stock at the nominal charge of 1s. per bottle, which is sufficient to treat three bushels of seed.

Sorghum or Sudan grass is preferable where a great bulk of more fibrous material is sought. Seeding rate for these crops should be 20 to 25 lb. per acre, in the case of sorghum, and 15 lb. per acre for Sudan grass.

White panicum sown at the rate of 15 to 20 lb. per acre is another suitable rotation crop, while maize sown at a rate of 30 lb. per acre also provides a good bulk of green material which is high in fibre.

All these crops should be sown in the spring after the last beans have been picked, and it is advisable, if practicable, to turn them in before mature seed has been produced; otherwise, a volunteer crop may appear later at a time when it is not wanted.

Recent Books.

"Fream's Elements of Agriculture."

The 1949 edition of this textbook, which was prepared under the authority of the Royal Agricultural Society of England, can be recommended to farmers and students as one of the most comprehensive available.

An extremely wide range of subjects is covered in 700 closely packed pages, and while some of the matter on practical crop and animal husbandry has little or no relation to Queensland conditions, there is an immense amount of information on both principles and practices which is of value to primary producers.

"Britain Can Breed It."

A booklet bearing the above title is being distributed by "The Farmer and Stockbreeder" (England) to remind overseas stockraisers that Britain is maintaining the high quality of its stud stock.

All the important British breeds of livestock are pictured, and accompanying notes set out briefly the origin and features of each breed.

A list of breed societies in Britain is appended for the benefit of those interested in importing pedigreed animals from the British Isles.

"Artificial Insemination of Farm Animals in the Soviet Union."

The Australian firm of Angus and Robertson Ltd. has recently published a translation of a standard Russian book on the artificial insemination of livestock. The publication is well illustrated, and describes Russian methods of collecting, examining, and storing semen of various types of livestock and of inseminating females.

Selecting Avocado Varieties.

H. M. GROSZMANN, Horticulturist, Horticulture Branch.

IN California, where avocadoes are grown on a large scale, the big proportion of seedling trees and inferior varieties is a serious handicap to the industry. In Queensland, where the industry is comparatively young, the same defect is already obvious in the low returns for fruit from such trees, and it is clear that some standardisation of varieties is essential. The number of varieties must be reduced to a minimum, and they must be the best available. The longer this change is delayed, the more costly it will become, while increased confusion in the market will continue to retard expansion.

In California dozens of varieties have been studied. From the best of these, several were selected by the Queensland Department of Agriculture and Stock for observation under Queensland conditions, and it is now possible to recommend varieties for current plantings. Two varieties, Fuerte and Nabal, should constitute the bulk of all plantings in the near future, and unprofitable seedling trees should be worked over to either one or the other. In choosing the above varieties, emphasis has been placed mainly on fruit quality.

Fruit of the Fuerte variety averages about 12 ounces in weight and carries well. Flavour and texture are excellent, the seed is small and the skin fairly thin. The fruit matures approximately from May to July inclusive, the period being somewhat dependent on locality and season. The tree is low-growing and large and will withstand frosts down to about 28 deg. Fahr. There is some indication that this variety fruits better on the basaltic plateaux near the coast than on the lower coastal land of southern Queensland.

The Nabal bears a large round green fruit, which is also of excellent quality. The seed is comparatively small, and the skin is thicker than that of the Fuerte. The season of maturity lasts from about October to December. The tree is large and vigorous, though a trifle tall. It is not as frost-resistant as the Fuerte. Heavy crops have been observed on both the lower coastal slopes and the basaltic plateaux of southern Queensland.

For some time it was believed that fruit setting in avocadoes could be improved by interplanting varieties from two distinct pollination groups. This practice may not be necessary here, but growers who wish to play safe can interplant their Fuerte and Nabal groves with a small proportion, about one to eight, of a third variety, the Anaheim. Because of its intermediate period of flowering, the Anaheim is not an ideal pollinator, but it does overlap the other two in this respect, and in any case it is a prolific bearer which comes into bearing at an early age.

Avocado groves consisting of these three varieties can be expected to bear payable crops of excellent quality fruit for the Australian market.

Junior Farmer Championships.

The Australian Broadcasting Commission's competition to select this State's representative to take part in the all-Australia contest to decide the champion junior farmer leader for 1949 was held at the studios of 4QG on the evenings of 24th and 25th March.

As was expected the competition aroused considerable interest. After eight competitors chosen from the nominations received had faced the judges on the first night, Messrs. Anthony L. Saclier (Swanfels), Gordon T. Reid (Willowvale), Kenneth B. MacDougall (Gayndah) and Stephen S. Dmitrieff (Thangool) were selected for the final test on the second night. Only a few points separated the four contestants, Stephen Dmitrieff being the winner with Anthony Saclier runner-up. The other two competitors tied for third place.

Stephen Dmitrieff, who is 19 years of age, is a prominent member of the Biloela Junior Farmers' Club and leader of the club's Thangool section. He put up an excellent performance to win the Queensland section of the contest, and subsequently went to Sydney as the guest of the A.B.C. to take part in the Australian final. The winner of this contest was a New South Wales entrant.

The winner of the Queensland girls' section was Ena Carpenter, of the Helidon club, who later competed in Sydney against girl club winners from the other States.

Both Queensland representatives are keen members of their clubs and thoroughly deserved their initial test successes.

Mr. T. L. Williams (State Director of the Junior Farmer Movement) said after the contest that he hoped many more clubs would be operating next year and that a still wider range of competitors would be offering for selection.

PLANT PROTECTION

The Mite Problem at Stanthorpe.

A. W. S. MAY, Entomologist, Science Branch.

THE widespread use of DDT in orchards in the Stanthorpe district has been a potent factor in the building-up of mite populations on fruit trees during the past season. Several species of mites are usually present in orchards but are normally kept under control by their natural insect enemies. The use of DDT for fruit fly or codling moth control results in heavy mortality among the parasites and predators of mites, but the mites themselves are not affected by the insecticide.

These notes have been prepared for the purpose or warning growers of the dangers of heavy mite infestations and of suggesting measures for combatting the pests.

Mites on Stone Fruits.

Although leaf injury caused by mites did not develop to any great extent before fruit harvesting and had little effect on the season's crop, considerable damage was evident in March and this may influence tree vigour next season.

Red spider and Bryobia mite, both well-known mite pests in orchards, have been prevalent, causing leaf mottling and russetting in Wilson and other early maturing plums. A third mite, known as the Eriophyid mite, has shown a very substantial increase in the past season on both peaches and plums. This mite, which is too small to be seen with the naked eye, causes silvering and curling of peach leaves, and in extreme cases symptoms that suggest a general decline in tree condition. On plums it causes a general yellowing of the foliage, accompanied by curling and stunting of the younger growth.

Where DDT is being used for fruit fly control, a suitable spray should be employed to check mite build-up. A dormant oil will effectively reduce the overwintering mite populations, but should be supplemented by a lime sulphur or wettable sulphur spray during the summer period. Where lime sulphur is used to prevent brown rot development, mites are automatically controlled.

Mites on Apples.

Mites have been very active on apple trees, causing yellowing or russetting of foliage as well as delaying fruit colouring. When they occur on a tree in very large numbers they have an appreciable effect on tree conditions before leaf symptoms become very evident, and in extreme cases the vigour has been materially retarded, with an associated heavy leaf fall.

Where codling moth control was based on DDT, mites bred practically unchecked after the application of the first codling moth cover spray in early November, becoming very prevalent in late January. Their injury will persist until leaf fall in late autumn.

Naturally, the use of DDT cannot be drastically reduced without prejudicing codling moth control, but the substitution of lead arsenate for DDT in certain cover sprays would reduce the mite problem without detracting greatly from the value of the codling moth control schedule.

Specific treatments for mite control should be aimed at preventing mite increase in the early summer and midsummer months. Dormant or semi-dormant oil sprays, while of great value, cannot be expected to completely solve the mite problem; but an early summer application of "Hexone," white oil (1–60), or wettable sulphur, either alone or in combination with the December cover spray, should greatly assist in preventing mite damage next season. Thorough tree coverage is, however, essential.

Dipping of Winter Bananas.

J. H. SIMMONDS, Officer in Charge, Science Branch.

BANANAS forwarded to southern markets during the cooler months of the year often develop squirter and winter black end, which are manifestations of a disease caused by a fungus.* The trouble is seen only rarely in Brisbane, as the fruit is usually ripened before the disease has time to develop properly. It is not seen in the plantation and hence most growers do not realise how serious squirter can be.

In a squirter infested fruit the centre of the pulp becomes decayed and rotten and may often be expelled by a squeeze of the hand—hence the name. The external appearance remains fairly normal. Winter black end is a black decaying condition of the fruit stalk which renders the fruit very unattractive and may also rot the tip of the pulp. As squirter does not show up clearly externally, buyers are loth to purchase fruit which is likely to develop the disease later, and so prices may be severely depressed.

It has been known for several years now that dipping the fruit in a solution containing salicylanilide will kill the spores of the fungus causing the disease and so prevent its development. These spores get on to the fruit in the plantation and packing shed, and once a suitable injury is made by breaking the finger stalk the fungus, unless prevented by the fungicide, can enter and rot the fruit.

Since a simple and effective remedy exists for this disease, authorities in most of the southern States have now decided to protect banana consumers by making it compulsory to treat all fruit marketed during the cooler months with salicylanilide. Queensland growers will have to comply with these regulations and directions for treating fruit are accordingly given here.

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* *Nigrospora sphaerica.*

Method of Treatment.

The fungicide salicylanilide is usually marketed in the form of sodium salicylanilide, which is a water-soluble powder. Two proprietary lines are now being marketed. A wetting and spreading agent should be added to the fungicide, if not already incorporated, to ensure that the fungicide thoroughly covers the fruit. The rate of dilution as recommended by the manufacturers should be used; it is usually 8 to 10 ounces of the commercial product to 30 gallons of water.

The fruit should be dipped in the solution after breaking into singles and part hands and either before or after packing. Dipping in the case is quite satisfactory and is perhaps the simplest method. A suitable bath can be made from a 44-gallon drum. A draining board should be provided to save the liquid. The fruit should remain in the solution until thoroughly wetted, the mixture being agitated if necessary to ensure penetration. The solution will remain active for two or three weeks, but should be discarded when dirt and debris accumulate.

INOCULATION OF LEGUME SEEDS.

★ ★

The Department of Agriculture and Stock supplies cultures of bacteria for the inoculation of seeds of legumes such as Poona pea, blue lupins, lucerne and clovers.

Seed inoculation is often necessary where the legume intended for planting has not previously been grown successfully, as it provides the plants with bacteria which are necessary for their full development.

Cultures are available for one shilling a bottle. Each bottle is sufficient to treat up to three bushels of seed.

Order from the Under Secretary, Department of Agriculture and Stock, Brisbane, at least 10 days before sowing. State amount and type of seed to be treated and enclose payment.

Factors Affecting the Composition of Milk.

PREPARED IN THE DIVISION OF DAIRYING.

A THOROUGH knowledge of the conditions which at various times affect the composition of milk is essential to milk and cream producers. A full realization of all factors involved will give a new interest to those engaged in milking and at the same time help them to understand why milk tests fluctuate in such a puzzling manner throughout the year.

A combination of conditions frequently affects the compositional quality of milk so seriously as to cause grave concern to both factory managers and producers alike, and at such times both the butterfat and the solids-not-fat are reduced below the minimum legal standards of 3.3 per cent. and 8.5 per cent., respectively.

The individual factors affecting the composition of milk are now fairly well known and are discussed in the following sections.

Breed.

This is the most important factor influencing the percentage of fat in milk. For instance, Jersey and Guernsey milks are usually richer than Friesian, with Australian Illawarra Shorthorn and Ayrshire intermediate between them, as shown in Table 1.

TABLE 1.

Breed.	Fat Percentage.
Holstein-Friesian	3·7
A.I.S.	4·0
Ayrshire	4·0
Guernsey	4·9
Jersey	5·3

Those breeds which produce a milk of high fat content give less milk than those which are low testers—for example, Holsteins, which are heavy producers, secrete milk of a lower fat percentage. However, the best representatives of the various breeds exhibit little difference

in the gross efficiency of milk production. Although some breeds normally produce a percentage of fat as much as 2 per cent. higher than that of others, the difference between animals of the same breed is occasionally greater.

The size of the fat globules also varies among breeds. Jerseys and Guernseys produce milk containing the largest fat globules and Ayrshires the smallest. In general, there is a slight tendency for the higher-testing cows of any particular breed to secrete milk with larger fat globules than that of the lower testing animals.

Individuality of the Cow.

This is probably the principal factor affecting the composition of milk. Possibly in every herd will be found cows that consistently produce milk abnormal in composition—for example, milk low in fat or in solids-not-fat. The variations due to individuality occur even when conditions of management, environment and feed are identical. Inheritance is the principal cause of these differences. Families of cattle within a breed have been found to secrete milk either higher or lower in fat percentage than the average for most of the same breed.

Stage of Lactation.

For five days after freshening, the secretion of the udder (colostrum) is rich in solids-not-fat, albumen and globulin being present in large quantities. Percentage fat increases during the next fortnight, and is then constant for about three months, but after this, as the quantity of milk decreases, the percentage of fat increases till the lactation period closes.

Season of the Year, Weather Conditions, and Temperature.

These are complex factors and their influence is very difficult to assess. Other factors being equal (which they never are) it would seem logical to expect small animals with relatively greater surface area per unit of liveweight to withstand high temperatures better than large animals. The colour of the animal may also be of some significance.

Efficiency of Milking.

Quick and thorough milking is found to have a marked effect on the quantity and richness of milk, sometimes as much as 30 per cent. more milk being yielded by a cow when milked by an efficient milker. Incomplete milking not only leads to a diminished yield and decrease in fat content but also contributes to the more rapid drying-off of the cow.

Interval Between Milkings.

The longer the intervals between milkings, the greater the amount of milk obtained and the lower the percentage of fat in the milk; hence night's milk is usually richer in fat than morning's milk.

Health of Cow.

The secretion of a cow in ill health is in most cases considerably reduced. No generalization on the effect of disease on the composition of milk can be made; the fat percentage may rise or fall.

Milk from sick cows is usually discarded because of its lowered palatability (principally because of an increased salt and catalase content) and for aesthetic reasons.

(*a*) *Mastitis.*—Milk from cows suffering from mastitis is often abnormal in chemical composition and may continue to be so even after the udder appears normal.

(*b*) *Colostrum.*—For five days after calving, the milk of the cow is of abnormal chemical composition and is known as colostrum. Colostrum is reddish-yellow in colour, and has a strong odour and a bitter taste. It is higher in albumen, casein, globulin and ash and lower in lactose than is normal milk. Colostrum, while being ideal nourishment for the calf, is unfit for human consumption. A comparison of the approximate composition of colostrum with that of milk (Table 2) shows its essential difference.

TABLE 2.

	Colostrum. Per cent.	Milk after 7 Days. Per cent.
Fat	3.4	3.9
Sugar	2.5	5.1
Casein	4.8	2.5
Albumen and Globulin	15.8	0.7
Ash	1.8	0.7
Water	71.7	87.1

Age of Cow.

Many investigations have been directed towards showing the effect of advancing age upon milk production. A considerable amount of variation has been observed, but the variations in fat percentage with age have been found to be unimportant from a practical point of view.

Kind and Quality of Feed.

These exercise a most important influence on the quantity of milk secreted, but as far as is known have no permanent influence on fat content. After a prolonged drought period the percentage of solids-not-fat, particularly casein, may be lower than normal owing to the lack of proteins in the foodstuff and the exhaustion of body reserves. In districts in which the soils are deficient in calcium and phosphorus, the herbage may also be deficient in these elements and the cow draws on these two elements from her own bones to prevent a deficiency in the milk.

Exercise.

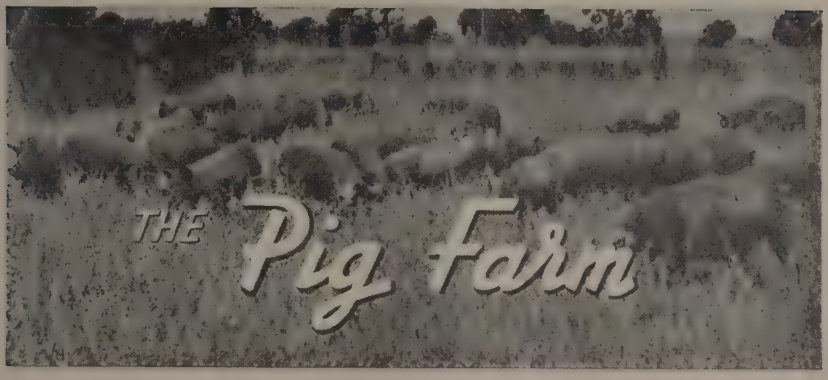
Experiments have shown that exercise tends to cause the percentage of fat in milk to increase slightly. Exercise also aids in the digestion of food.

Excitement and Oestrum.

The cow being a nervous animal, the fat content in milk may be affected by any condition which causes undue excitement or nervousness. Sexual excitement, oestrum or "heat" induces varying effects depending upon the individuality of the animal. With some cows there is no appreciable change in the composition of the milk, while in other cases the composition of the milk is slightly affected.

Other Factors.

These include frequency of milking, methods of milking and condition of the animal.



Losses in the Pig Industry.

F. BOSTOCK, Officer in Charge, Pig Branch.

CONSIDERABLE losses are caused to the pig industry each year by the death of pigs and the condemnation of carcasses; such losses could be reduced if greater attention were given to housing, management and feeding.

Housing.

Dilapidated, unhygienic sheds, broken troughs and filthy condition of surroundings, often deep in mud, etc., contribute largely toward lowering resistance of the pig to disease-producing germs. Under such conditions pigs are likely to develop digestive troubles, pneumonia, arthritis or other troubles which often result in high mortality or condemnation of carcasses, and the pigs that do survive prove unprofitable.

Any expenditure involved in building suitable housing will be amply repaid by the production of healthy stock, decrease in labour costs and improvement in management. The cost of accommodation should be calculated on a per head basis of each pig likely to be produced in the piggery. Such costs will usually be found to be low and it is more often than not false economy to save a few pounds in the initial outlay, when such a saving may mean slower growth, greater labour costs and greater risk of disease.

Piggeries do not have to be elaborate, but should be airy and large enough to prevent overcrowding, yet free from draughts. They should allow plenty of sunlight to enter and be provided with good drainage. The site should be such that enough well-drained land is available for runs and, if possible, paddocks for cultivation to produce supplementary food.

Purchased pigs may easily be the cause of outbreaks of disease and a quarantine pen should accordingly be provided. Such pigs may be diseased when purchased or may suffer digestive disorder, lowering their resistance, as a result of the change of food; in such circumstances the disease germs present greatly increase and become capable of causing mortality. The whole herd may suffer, because even if the death rate is not high affected pigs become unthrifty, thus reducing the margin of profit.

Feeding.

To keep pigs in good condition and gaining weight, the ration must be properly balanced and fed at regular intervals. In the case of brood sows, proper feeding is most important if strong litters of healthy pigs are to be produced.

Too often sows are turned out to forage for themselves immediately after their litter has been weaned, and expected to exist as best they can until they again farrow. This is a very short-sighted policy, as the care of the sow during gestation will considerably help to secure a vigorous litter which, with reasonable attention, can be expected to reach maturity with a minimum of loss.

Considerable strain is put on the resources of a sow during pregnancy and lactation, and if there is any possibility of the rations being deficient in calcium a mineral supplement should be fed. Such a deficiency is likely to occur when the supply of milk is limited or green feed poor, and suckers born under these conditions are likely to be stunted and unthrifty.

Care should be taken to see that any change of ration before or after farrowing does not cause digestive disorders or a check in the milk flow. To eliminate any tendency to constipation, a small quantity of molasses may be added to the ration.

Management of Sows.

F. BOSTOCK, Officer in Charge, Pig Branch.

FROM observations both in this country and overseas it is known that—

(1) A considerable proportion of sows fail to get in pig immediately after weaning a litter.

(2) Where conception takes place about one-third of the ova shed do not give rise to full-time offspring. The cause of the failure of some ova to be fertilized, or if fertilized to complete foetal development, is obscure, but it is known that the condition and health of the boar at the time of service and the feeding of the in-pig sow play a considerable part.

(3) Nearly 5 per cent. of all pigs born are born dead.

(4) A further 15 per cent. die before weaning, generally in the first two or three days.

(5) In general the more pigs born in a litter the greater the number weaned.

(6) In large litters the average birth weight is usually low, and small, poorly developed pigs are likely to be born dead, to perish early after birth, or to be slow growers if they do survive.

Sows when fed so that they do not become too poor at weaning time, and are rapidly improving in condition when they take the boar

and for a few weeks after mating, are more likely to breed regularly than are sows which are allowed to become poor or are merely turned out in the grazing paddock, without any extra feeding, after weaning a litter.

Low number of pigs reared per sow and failure to get two litters per year can be very largely overcome if more attention is given to the above facts.

Feeding during the last six weeks of pregnancy is most important to ensure well developed pigs at birth. The ration should be rich in protein, in order to nourish the rapidly developing litter and provide sufficient to enable the sow to improve in condition without becoming over-fat. These general principles of feeding the pregnant sow, if properly applied, should result in fewer stillborns, stronger pigs born (which are less likely to die in the first few days of life) and rapidly growing young stock.

Losses at and shortly after farrowing to a large extent depend on the selection of breeding stock and temperament of the sow, for the mothering instinct well developed will always be of great importance. Do not keep a clumsy sow.

See that the boar is kept in good working conditions, without sudden variations of food or alternating periods of starvation and over-feeding. Keep the boar in a pen by himself and turn sows in for mating on the second or third day of heat.

QUEENSLAND SHOW DATES.

Atherton	July 25-27
Ayr	July 8-9
Beenleigh	September 16-17
Blackbutt	June 3-4
Boonah	June 3-4
Bowen	July 6-7
Brisbane R.N.A.	August 6-13
Bundaberg	June 9-11
Cairns	July 19-21
Canungra	September 10
Charters Towers	July 5-6
Childers	June 6-7
Cooroy	August 27
Crow's Nest	May 27-28
Dirranbandi	May 27-28
Esk	July 1-2
Gatton	July 21-23
Gin Gin	June 13-14
Gladstone	June 16-18
Gympie	May 26-28
Home Hill	July 1-2
Ingham	July 15-16
Innisfail	July 29-30
Kalbar	May 28
Kandanga	Sept. 2-3
Kilcoy	June 24-25
Kilkivan	June 10-11
Laidley	July 8-9
Lawnton	July 29-30
Lowood	June 10-13
Mackay	June 28-30
Maryborough	June 2-4
Millaa Millaa	September 23-24
Mount Morgan Show	June 2-3
Mt. Morgan Camp Draft	June 4
Nambour	July 7-9
Pomona	September 9-10
Proserpine	July 1-2
Redlands	July 15-16
Rockhampton	June 22-25
Rosewood	July 15-16
Southport	September 2-3
Toogoolawah	June 17-18
Townsville	July 12-14
Tully	July 22-23
Woodford	July 15-16
Wowan	May 26-28

Poultry Keeping on the General Farm.

P. RUMBALL, Officer in Charge, Poultry Branch.

(*Continued from page 247 of the April issue.*)

FEEDING FOR EGG PRODUCTION.

The laying fowl has to provide from her food supply for—

(1) Maintenance of vital functions;

(2) Growth requirements; and

(3) The production of eggs.

The first call upon the food supply is obviously for the vital functions, then growth; any surplus nutrients are used in the formation of eggs. It will, therefore, be seen that the greater the production the greater will be the consumption, and that egg production is only possible by feeding quantities of food in excess of body requirements. It is generally estimated that a hen in full lay will consume about 2 ounces each of grain and mash per day. This quantity, however, will be excessive at times, and may be deficient during the period of peak production.

Most available cereal foods are generally deficient in protein, and in preparing a ration it is necessary to use protein-rich foods in the form of milk, milk powders, and meatmeal. Protein-rich vegetable foods may be available, but it has been found from experience that animal proteins give better results than vegetable proteins. This is probably because of their greater palatability and the fact that the range of amino-acids is wider. From practice, it has been found that rations having a total protein content of 15 per cent. give satisfactory results. As protein-rich foods are the most costly, it will readily be understood that the object of the feeder should be to use the minimum quantity necessary for maximum production.

The poultry raiser who does not desire to prepare his own ration may buy laying mashes to be fed in combination with grain, also all-mash. These laying mashes should have approximately 18 to 20 per cent. of crude protein; when fed in combination with grain—say, equal parts of maize and wheat—the total crude protein content of the ration is reduced to about 15·5 per cent.

In addition to the protein and carbohydrate, the mineral content of the layer's ration has also to be taken into consideration. The average amount of carbonate of the egg shell is one-fifth of an ounce.

To supply the requirements, say, in the mash, 4 per cent. of calcium carbonate would be necessary, but as hens not laying would only void the material it is a better practice to have shell-forming material in the form of limestone and shell grit always before the birds in separate containers.

Commercially, yolk colour has not apparently been given much consideration, but very pale-yolked eggs are not in popular demand. To overcome this, green feed and yellow maize should form a definite part of a laying ration. Both foods are rich in vitamins, and green feed materially assists in supplying the mineral requirements of poultry. In the absence of green feed, lucerne chaff or meal should be made available.

REPLACEMENT OF FLOCKS.

As previously mentioned, very few hens are retained for egg production longer than two years. This fact, together with the constant culling practised on a well-conducted farm and normal mortality, necessitates the replacement of approximately 60 per cent. of the flock each year.

It is of little use replacing old and culled hens if such replacement is not made with better producers.

Flock replacement may be made by selecting and mating the best of the birds, by the purchase of eggs for hatching, or by buying day-old chickens.

Success in poultry raising requires a close association with the birds in order to obtain records of production, and the necessary ability to select satisfactory breeding stock. This close association is usually impracticable on the average farm, so the purchase of day-old chickens is ordinarily the soundest practice.

Expansion in the poultry industry has brought with it modern equipment that permits of day-old chickens being hatched by the specialist breeder at a cost lower than that at which the small flock owner could produce his own. Incubators of 16,000 egg capacity are in operation in Queensland. These machines work at full pressure for at least three months of the year. Commercial hatcheries thus make it possible for the farmer to replace his flock with chickens hatched during the most suitable period of the year. They relieve him of the necessity of selection, mating, and incubation on his own farm, and if the chickens are obtained from a reputable source, his maintenance of a profitable flock is assured.

INCUBATION.

Although incubation can be successfully conducted throughout the year, the most profitable period in which to hatch chickens is from June to September. Chickens hatched later do not thrive and are more susceptible to disease.

Eggs should be carefully selected for incubation purposes for size, shape, and texture of shell. It is important that only eggs which exceed 2 ounces in weight be incubated in order to maintain a good commercial product. Misshapen eggs should be rejected. Eggs having porous or thin shells allow the contents to evaporate, resulting in poor hatches. If eggs for incubation are to be kept longer than one week, they should be turned daily; by this process, they can be kept for two weeks. Fertile eggs should be stored in a cool place free from draughts.

Natural Incubation.

With natural incubation difficulty is always experienced in having hens broody at the right time. When setting a broody hen, the nest should be made comfortable and darkened. The bird should be dusted with insect powder before the eggs are placed under her and again before hatching occurs. After setting the hen should not be disturbed for 36 hours. She should then be allowed to come off daily for food, water, and a dust bath. The hen should be fed on whole grain.

Artificial Incubation.

Instructions are supplied with incubators, and should be followed by the operator.

Housing.

An incubator should be housed in a well ventilated room with an even temperature. Underneath a dwelling on high blocks is an excellent place for an incubator. The incubator should be level and firmly based.

Management (Table top incubator).

The incubator should be washed and disinfected after each hatch. The lamp should be filled and the wick and burner trimmed daily; an old toothbrush may be used to clean the wick.

The incubator should be heated for at least a day before putting in the eggs, so as to be ready for regulating the temperature evenly at 102 degrees, with the bulb of the thermometer level with the top of the eggs. The eggs should be set in the morning. The thermometer should be tested for accuracy at the start of the season.

After having been set, the eggs should be left alone for 36 hours, after which they should be turned twice daily to the 18th day. The eggs should be cooled every day, commencing with 5 minutes the first week and extending the period to 10 and 20 minutes during the second and third weeks respectively. It will be necessary to remove infertile eggs during the hatch. This should be done on the 7th and 18th days.

The greater the ventilation the more moisture is required. If there is very little ventilation in the incubator, the machine may be successfully operated without moisture.

BROODING.

The artificial brooding of chickens is a difficult process with an inefficient plant. The object of the breeder is to keep the chickens warm and comfortable and to wean them from heat as quickly as possible.

Two systems of brooding are in common use in Queensland, namely, what are known as cold brooders and heated brooders. In both systems many types of brooders are used.

Cold Brooders.

The term cold brooding is a misnomer. Artificial heat is not supplied, but the heat of the body of the chicken is retained by means of cloths or flannel and a restricted circulation of air. This system of brooding has been practised for many years, but it is only in comparatively recent years that it has been used to any great extent by

commercial poultry farmers. The cold brooder can be used in brooder houses or rearing pens with an equal degree of success. Although the cold brooder may be apparently as effective as the heated brooder, the latter is preferable. It is easily understood that the placing of chickens, after travelling for a day or so, under a cold brooder warmed by their own body heat would not be as beneficial as placing them under a heated brooder. Also, in cold bleak weather the heated brooder would have an advantage over the cold brooder.

Heated Brooders.

There are many types of heated brooders, of both the box and the colony type. The former type is not used to any extent in this State. This may be because of the cost of installation of a suitable type, or the generally satisfactory results derived from the colony system.

Colony Brooder.

Where large numbers of chickens are to be reared, the colony brooder is the cheapest and most effective. With the colony brooder, several hundreds of chickens can be run together with little more trouble and attention than would be required for a hundred under any other ordinary brooding system. This system also permits of a very much freer movement of chickens once they know the source of warmth, and assists in their retention of that keenness in life which is essential to health and growth.

Four hundred chickens should, however, be the limit in any one colony brooder, but possibly 100 fewer would give better results. It is also generally a sound rule to depreciate the capacity claimed for brooders by most manufacturers.

The colony brooder consists of a heater with a metal hover for the purpose of deflecting the heat. The fuel used may be coke, sawdust, kerosene, or electricity. Whatever type of colony brooder is used, it should be housed in a special brooder house. It is possible to operate brooders in open-fronted houses by cutting off ground draughts, but obviously when such is the case considerably more fuel is used. With kerosene and electricity-heated brooders the increase in the costs of heating in open-fronted houses would be considerable. With sawdust and coke brooders costs are not excessive, but the great disadvantage of open-fronted houses is keeping up a uniform temperature. It is found in practice that they will burn out within 12 hours, with consequent chilling of the chickens.

A suitable-sized building to house a 400 colony brooder would measure approximately 14 feet by 16 feet and at least 6 feet high. The roof may be either a hip-roof or a skillion. The building should be lined and ceiled and provided with ample light. It should face north-east or north and be arranged so that sunlight can be freely admitted. Lighting through glass is desirable in bad weather, but direct sunlight is necessary to admit of the ultra-violet rays. Otherwise, cod liver oil is an essential addition to all chicken-mashes in order to supply vitamin D. A few weeks of brooding without sunlight or cod liver oil would soon result in leg-weak chickens. Sunlight is the cheaper.

The house may be built of timber or iron. Iron, being more lasting and offering less harbourage for vermin, is preferable. The

lining and ceiling should, for preference, be of ⅝-inch tongued and grooved pine, but for economy wheat sacks sewn together and white-washed will serve. The floor should be concreted and a thin concrete wall sunk into the ground to a depth of 18 inches. This wall prevents rats burrowing under the floor, while the concrete floor is easily cleaned.

Temperatures.

In heated brooders, temperature is very important. If the temperature is too low, the chickens crowd together. Correct heating is the only method by which this can be prevented. Overheating should also be avoided because of its weakening effect and the consequent difficulty in weaning from the brooders. The general comfort of the chickens is a sure index that the temperature is fairly satisfactory, and if the droppings are well distributed under and around the hover in the morning, it is proof that the chickens have been fairly comfortable. When chickens are first put into the brooder they come from a nursery in the incubator which generally has a temperature of at least 90 degrees, and so it is as well to start brooders at this temperature, gradually reducing it until heating can be dispensed with in from 4 to 6 weeks.

Ventilation.

With some types of brooders, many chickens are lost through lack of ventilation and over-crowding. Brooders usually made to hold 100 day-old chickens are generally too small for the same number of chickens a week old. It frequently happens also that the attendant makes no allowance for additional ventilation with the growth of the chickens, and, although he may have been successful in rearing them to the age of one week, they then start crowding and dying. Lack of ventilation has a great weakening effect on both young and old stock. It causes the young to crowd, and renders the older birds more susceptible to disease. When chickens have crowded, they present a wet appearance in the morning, to which the term "sweating" is applied. Sweating is not the cause. The wetness is caused by the condensation of the moisture content of the breath which would have been carried away if proper ventilation had been provided. Chickens which have been overcrowded rarely recover from the ill-effects, and so it should be avoided strictly.

In brooding under any system the following points are essential:—

(1) Limited range, increasing with age.

(2) Sufficient heat, which should be reduced as soon as advisable.

(3) Ventilation, which should increase with age.

(4) Ample accommodation. What may be just enough room for 100 day-old chickens rapidly becomes too small as they grow.

(5) Never attempt to brood chickens of mixed ages.

Placing Chickens in Brooders.

Before chickens are placed in brooders the floors should have a light dressing of sand or soil to absorb any excreta and to give the chickens a good footing. A small amount of litter, such as soft straw or chips, will provide exercise and so keep the chickens active.

With both hot and cold brooders, the liberty of the chickens should be restrained for a start. This can be done by erecting a barrier of

wire netting around the brooder (Plate 153), increasing the area day by day. At the end of about one week, they may be given the liberty of the brooder house. With the cold brooder, the netting should only allow a range of two or three inches for the first day. With the colony brooder, the range will depend on the heat given off by the brooder.

Plate 153.

Electrically Heated Colony Brooder.—When chickens are first placed under the brooder they should be confined to within one foot of the outside edge and their range increased from day to day.

What is necessary is to educate the chickens as to the source of heat, and when this is done to encourage them to take as much exercise as possible by ranging over the floor of the entire brooder house (Plate 154).

Most breeders have outside runs to their brooder houses and the chickens are allowed out in them after they are about a week old. Outside runs are not necessary if the brooder house is so constructed as to permit of an abundance of light and sunshine. However, when runs are provided the chickens should be driven in after they have been out for an hour or so on the first occasion. They may be allowed out again in the course of an hour or so. This should be repeated in order that the chickens will learn to return to the brooder house and avoid to a large extent the possibility of their being caught out in a rain storm or staying out too long and becoming chilled.

Sanitation.

Cleanliness is essential. Insanitary conditions not only pollute the atmosphere of the brooders, but are frequently the cause of the rapid spread of serious diseases in very young chickens, in whom bacillary white diarrhoea is responsible at times for heavy mortality. ' The

chickens are very susceptible to this disease within the first 10 days. The organism responsible is voided in the excreta; consequently a few diseased chickens might easily be responsible for the spread of the disease among the whole brood. This fact emphasises the advisability of destroying sick chickens and the regular and frequent cleaning of brooders.

Plate 154.

COLONY BROODING.—Week-old chickens, with full range of the brooder house.

Coccidiosis, another disease to which chickens are subject, is spread through the medium of the droppings. With bacillary white diarrhoea, some affected chickens are the result of affected parents and when hatched are already diseased. With coccidiosis, the chicken contracts the disease after hatching. Many full-grown birds are affected with coccidiosis. The organism may therefore easily be carried on the feet of the person attending them to the brooders. Strict sanitation and precautionary measures give reasonable assurance of protection against the disorder. Brooder houses should be cleaned out every second day and the sleeping quarters daily.

WEANING.

When chickens are from 4 to 6 weeks old, it is generally necessary to remove them from the brooders to make room for others. This is also necessary to protect the soil from becoming too foul and the chickens too soft by prolonged supply of heat. Correct brooding will materially assist the weaning process, as the heat should have been gradually reduced.

The chickens were trained in the early stages of brooding and training again is essential. Poultry are largely creatures of habit and

may generally, with care, be trained to act as required. When once they form a habit—good or bad—it is difficult to alter. A little time spent in seeing that chickens take to their new quarters during the first few nights will amply repay the poultry keeper and prevent losses which occur when growing chickens crowd into corners.

Chickens may be placed in permanent laying quarters or colony houses when they are weaned. The permanent house may be an intensive laying shed or a special colony house. The colony house is an excellent system, provided it is situated on clean land and that the colony is not contaminated with the droppings of older or diseased birds.

The number to be put out together varies, of course, with the accommodation available, but larger flocks than 100 are not recommended; 50 would be safer.

A good rearing house for 100 chickens should be at least 10 feet long and 8 feet deep—with, of course, free range. The house should be 5 feet high at the back and 6 feet high in front. Ventilation should be provided by leaving a space of three inches between the top of the back wall and the roof. As a protection from south-easterly weather, at least 4 feet of the eastern front should be covered with iron. The rest of the front should be netted and provided with a gate in order that the birds can be shut in overnight as a protection from foxes and other marauders.

GENERAL MANAGEMENT.

When the chickens are taken from the brooder quarters and placed in houses to be weaned, they are too young to perch of their own free will. Various arrangements have to made to prevent crowding.

Plate 155.

Weaning Perches.—Chickens upon leaving the brooder house must be taught to perch. Netting frames with a ramp make this job comparatively easy.

Some breeders bed them down on straw. The straw, if used, should be fairly deep and loose and well heaped up in the corners of the house. The chickens appear to be content to snuggle in the straw instead of making warmth by crowding together. It is then only necessary to go around in the evening with a fork and loosen the straw up. In the shaking the droppings fall on the floor and are easily cleaned up. With this system of weaning, perches should be erected later and the birds allowed to take them at will.

Another system of weaning, and one that teaches the bird to perch at the same time, requires a wire-netting platform about 6 inches from the ground with a netting run-up (Plate 155). On the top of this frame several strips of 2 x 1 timber are attached. The chickens at night are not allowed to rest anywhere but upon this platform. They certainly crowd together for a start, but soon spread out. The netting allows for circulation of air. It is necessary to watch the chickens for the first few nights, but as soon as they have settled down they may be left. This platform should be made the full width of the house and placed at the closed end.

The chickens as they develop should be thinned out. No hard and fast rule can be laid down as to when thinning out should be done, as it depends on the space available.

THE FEEDING OF CHICKENS.

In the feeding of chickens, it is most important to bear in mind that nature has provided for the first day or so of the chicken's life, as, just before hatching, the remainder of the egg yolk is drawn into the abdomen of the chick. Most breeders allow at least 48 hours to elapse before feeding. Chickens fed earlier are subject to bowel troubles. Prolonged starving, however, should not be practised, as it may have a weakening effect from which many chickens do not recover.

Requirements for Growth.

Chickens make very quick growth in the early part of their life. This development is most rapid during the first six to eight weeks; consequently rations having a relatively high protein content are necessary to give the best development. From experimentation, it has been established that rations having a crude protein content of 20 per cent. should be used during the first six to eight weeks, after which the protein should be reduced to 15 per cent. The protein requirements of a chicken may not alter so sharply, but these periods of protein content are suggested as applicable to the practical needs of the poultry raiser.

It is a common practice among poultrymen to cut down the protein content of rations after the chickens are about 16 weeks of age, in order to delay sexual development. This is desirable if the birds are maturing too rapidly, but development can be controlled to only a very limited degree. Excessive protein feeding should be guarded against, as it is likely to cause deposits of urates in the ureter, kidneys, and other organs, as well as placing an undue strain on the liver.

It is generally conceded that milk is the most desirable protein feed for chickens and growing stock, but because of its cost its exclusive use may not be possible. Wherever practicable, milk should form a portion of the ration. It may be given in the form of curds, semi-solid milk,

buttermilk, or buttermilk powder. Milk is excellent as a drink, but it is objectionable because of the difficulty of keeping chickens clean. Buttermilk powder is suitable, because of the ease with which the powder may be incorporated in the mash, thereby controlling the kind of food that each chicken consumes. It has, however, no definite advantage from a feeding-value point of view, apart from its concentration. Proteins build up the flesh, but at the same time a bony framework is necessary. Analysis of the chicken at different ages indicates that it is particularly important to allow for the mineral requirement from the 11th to the 24th week. In all experiments conducted by the Department of Agriculture and Stock, the increased mineral intake has been allowed for by the addition of bonemeal to the mash at eight weeks of age and by allowing the birds free access to grit (shell and hard).

Food Consumption of Chickens.

The question is often asked: How much food should be given to chickens? Probably, no better reply can be given than to publish a table based on actual experiments conducted at the Animal Health Station at Yeerongpilly.

Food Consumption and Weight of Chickens.

Age.	Leghorns.		Australorp.	
	Weight of Chickens.	Food Consumed.	Weight of Chickens.	Food Consumed.
	Oz.	Oz.	Oz.	Oz.
Day old	1·3	..	1·36	..
1 week	1·97	1·64	2·14	1·53
2 weeks	3·31	3·36	3·61	3·32
3 weeks	5·31	4·80	5·84	5·05
4 weeks	7·61	6·46	8·68	7·20
5 weeks	9·94	7·58	12·08	6·89
6 weeks	12·92	8·96	15·86	10·62
7 weeks	16·65	8·65	20·17	13·95
8 weeks	20·41	13·29	25·31	15·05

The variation in weight from week to week and the ever-increasing amount of food required suggest the undesirability of indicating specifically what should be supplied.

The food requirements increase week by week, and a system of feeding where the growing birds may consume all they require is the more desirable.

The all-mash method of feeding chickens is suggested, because the kind of food consumed is easily controlled and it is always in front of the birds. All-mash should be placed in shallow trays about 1 inch in depth during the first few days. The trays should then be increased to a depth of 2 inches, and by the end of the first week troughs about 4 inches wide may be used. At this age chickens will commence to scratch, scattering the feed from the trough. This can be prevented by placing a piece of netting on top of the mash loose enough to sink as the mash is eaten. During the first week, 8 feet of feeding space should be allowed for every 100 chickens, and later increased to 12 feet. Before the mash is covered with netting, it is important that only a little food at frequent intervals should be placed in the trays in order

to avoid wastage. In fact, frequent feeding of all-mash appears to induce a greater food consumption, resulting in better development.

Breeders who do not desire to feed an all-mash may use commercial chick grains and growing mashes which may be fed as directed by the manufacturers. It has been the general custom for many poultry raisers to use scratch grain only for a short period of a chicken's life: but, in view of the more satisfactory results obtained by feeding a ration of a relatively higher protein content than chick mixtures usually have, early mash feeding seems to be essential.

Chickens may be reared satisfactorily on moistened mashes and grain from about two weeks of age, but the mashes should be fed at frequent intervals. This system has the advantage of utilising milk for moistening the mash when it is available. The feeding of dry mash, however, is suggested as a safer method of feeding, as the possibility of food becoming sour, with the probable consequence of bowel trouble among chickens, is avoided.

Suitable All-mash Mixtures.

Suitable all-mash mixtures for various classes of birds are given in Tables 1 and 2.

TABLE 1.

ALL MASH—CHICKENS DAY-OLD TO 6 TO 8 WEEKS.

Ingredient.	Mixtures.			
	1.	2.	3.	4.
Yellow Maize Meal	38	..	..	20
Wheat Meal	..	43	43	20
Sorghum Meal	..	20	20	25
Bran	20	20	15	10
Pollard	20	..	..	..
Lucerne Meal	..	..	5	5
Protein Meal (55 per cent.)	9	9	14	12
Buttermilk Powder	10	..	..	5
Liver Meal	..	5	..	..
Ground Limestone or Shell	1	1	1	1
Synthetic Riboflavin	..	..	As directed by vendor	As directed by vendor
Vitaminised Preparation	1	1	1	1
Manganese–Salt Mixture*	1	1	1	1
	100	100	100	100

* Manganese–salt mixture consists of a mixture of 4 ounces of commercial manganese sulphate and 20 pounds of commom salt.

If a good succulent green feed is not available to be fed in conjunction with these mashes a vitamin A preparation should be used as a supplement.

Owing to the impossibility of obtaining a wide range of ingredients, mixtures have to be very simple. Where bran is not available a good sample of crushed whole oats would make a useful addition. Oats of good quality are a valuable food. They have been omitted as they are not usually available.

TABLE 2.

ALL MASH—GROWING BIRDS 8 TO 20 WEEKS.

BIRDS HAVING ACCESS TO DIRECT SUNLIGHT.

Ingredient.	Ration.			
	1.	2.	3.	4.
Maize Meal	35	..	..	..
Wheat Meal	30	40	51	66
Sorghum Meal	..	22	12	..
Bran	10	10	..	20
Pollard	20	10	20	..
Lucerne Chaff (Leafy) ..	4	4	6	4
Protein Meal	5	8	9	6
Ground Limestone or Shell ..	1	1	1	1
Manganese–Salt Mixture ..	1	1	1	1
Liver Meal	4	..	..	2
Milk Powder	..	4	..	2
Synthetic Riboflavin ..	..	..	As directed by vendor	..

FARM FACTORS INFLUENCING MARKETING.

Marketing has to be considered in relation to (1) the egg; (2) table birds, including birds specially reared for the purpose, stock that have ceased to be profitable, and cockerels; and (3) poultry manure. The lastmentioned product is of increasing importance.

Marketing, particularly in the first stage, is certainly a function which definitely concerns every poultry-keeper. It is not merely the task of the Egg Boards or the commission agents. The poultry-keeper considerably influences the ease of marketing by the maintenance of egg quality. If every consideration is not given to the preservation of the quality of the egg as laid, the task of marketing is made most difficult. Producers should remember therefore that the earlier the egg reaches the consumer after being laid the better.

The principal factors influencing successful marketing are:—

(1) The production of infertile eggs.

(2) Clean and ample nests (one nest for every five birds). Eggs when laid are moist, and dust and other matter adhere to them.

(3) Gathering at frequent intervals to prevent eggs becoming soiled.

(4) Collecting in clean and dry receptacles.

(5) Storage (pending marketing) on the farm in cool quarters free from draughts and foreign odours.

(6) Regular and frequent despatch to market—twice weekly during warm weather; once weekly during winter.

(7) Using dry, clean fillers, and cases free from moulds when packing for market.

Careful attention to the quality of the egg is necessary, as quality influences demand.

The basis of the poultry industry is egg production, for which breeds—such as Leghorns and Australorps—are bred, Leghorns predominating. The classes of birds sold mostly for table purposes are young cockerels of both light and heavy breeds and hens culled because of their age, or for other reasons which make them unprofitable to keep as egg producers. Every producer has to consider such questions as the time of marketing, condition of stock, grading, and crating.

Most of the birds a producer has for sale are cockerels, which have to be sold during a relatively short period. They may be sold at various ages, each age having its special advantage. Although most buyers prefer young stock for table purposes, they will not pay high prices for small half-grown birds when larger hens are available, which would be proportionately much cheaper. It is not a sound practice, therefore, for the producer to send half-grown cockerels to the market and expect to receive good prices for them during the period when most old hens are being sold because of age. This period varies in duration, but usually extends from some time in January until April. Young half-grown birds will find a ready sale from August until the Christmas season. After then, young stock should be well grown to command good prices, but should not be kept until they become staggy, which is indicated by spur growth.

TABLE 3.

MASH–GRAIN RATIONS.

——	1.	2.	3.	4.	5.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Grain—					
Wheat	100	50	..	50	..
Maize	..	50	100	..	..
Sorghum	..	..	..	50	100
Mash—					
Wheatmeal	26	..	..	..	..
Maize Meal	..	18	10	..	..
Sorghum Meal	..	..	..	23	20
Crushed Oats	..	..	23	..	..
Bran	16	20	..	16	16
Pollard	33	31	40	34	36
Meat and Bone Meal	10	14	14	13	13
Buttermilk Powder	4	4	4	4	4
Linseed Meal	..	2	..	..	..
Lucerne Meal	10	10	8	9	10
Salt	1	1	1	1	1

Supplements—	
Vitamin A	Unnecessary if choice lucerne meal is fed; otherwise feed fish oils.
Calcium	Shell grit *ad lib* or ground limestone or oyster shell at 2 lb. per 100 lb. mash.
Synthetic Riboflavin	If buttermilk powder and liver meal are short, use synthetic riboflavin for breeders. In all rations buttermilk could be replaced by meat meal or linseed meal and synthetic riboflavin added.

It is necessary to give some attention to the general condition of the birds to be marketed. No good is done by sending in stock for sale in low condition, especially when it is considered that, in old hens particularly, there may be only a few in such a state. It is not suggested that any attempt be made to fatten birds of this class, as they are usually constitutionally unfit, and the producer's ends would be better served if they were destroyed, as it may happen that these particular low-conditioned birds will be first examined by prospective buyers, and their presence may depreciate the value of the whole consignment.

Cockerels, however, should receive some consideration and not be treated, as they often are, as an encumbrance and not worth feeding. If they are to be kept for any length of time at all, they should be well treated and receive the same attention as the pullets. They require, for economical growth, the same ration as the pullets; and should be kept free from intestinal worms and sold as early as possible.

Feeding systems for laying fowls vary. The most popular is the feeding of dry mash and grain, although the all-mash method is used by some. For those who desire to prepare their own mixtures rations given in Table 3 are suggested as a working basis.

Modern Milking Methods—A Correction.

On page 158 of the March issue of the Journal it was stated that "In normal milking this stimulus (to milk let-down) is best provided by adequately washing the cow's teats and udder with warm milk (110 deg. F.)." As stressed in the detailed discussion of milking which followed, warm water and not milk should be used for washing the teats and udder.

To Pull Out a Bogged Tractor.

A hint for getting a tractor out of a sandy or muddy patch is given in "Handy Farm and Home Devices," which is selling on behalf of the Queensland Blinded Soldiers' Association.

As shown in the illustration, two pieces of 4 x 4 hardwood are fitted with eyebolts and short lengths of chain. The chains are just long enough to encircle the tyre and rim, and the blocks are attached as shown when difficulty is encountered in moving the tractor.

(The book is available from Mr. A. V. Loughrey, G.P.O. Box 1400B, Brisbane, for one guinea.)

Hand-feeding Sheep in Drought Time.

G. R. MOULE, Officer-in-Charge, Sheep and Wool Branch.

(*Continued from page 238 of April Issue.*)

CHOOSING DROUGHT RATIONS.

If it is decided to feed, the drought ration should be chosen upon:—

(i.) Availability of the foodstuff, which can be determined from market reports;

(ii.) The feeding value of the foodstuff and its cost per food unit;

(iii.) Suitability of the food for the purpose, including palatability and bulk/weight ratio, which is important from the point of view of ease of handling.

The value to the sheep of drought foods varies a good deal because of differences in their composition. These include variations in protein, carbohydrate and mineral contents, but to give an over-all figure as a basis for comparison the food value of each of the feeds most commonly used in Queensland is set out in Table 2. The values are given in percentage "drought food units," which is a composite term that takes into consideration the food value of the various feeds to drought-stricken sheep.

TABLE 2.

DROUGHT FOOD UNITS OF COMMON FOODSTUFFS.

Foodstuff.	Number of Drought Food Units per 100 lb. of Foodstuff.
Roughages—	
Cereal chaff	40
Lucerne chaff	40
Concentrates—	
Maize, wheat, barley, sorghum, linseed meal, and cottonseed meal	77
Meatmeal	70
Nuts (varies with brand; average figure only)	65
Oats	60
Molasses	52

When purchasing feed during drought it is essential to buy on a basis of food values. As the available foodstuffs vary considerably in food value, different amounts of individual feeds are required to maintain sheep.

This is shown in Table 3, which gives the number of sheep fully maintained by a bag of food per week as well as the number of tons per 1,000 sheep per month required for full maintenance.

TABLE 3.

Sheep Maintenance Values of Various Foodstuffs.

Foodstuff.	Ounces Equivalent to 8 oz. of Maize.	Lb. per Cornsack.	Sacks per Ton.	Number of Sheep Fed at Rate of 8 oz. of Maize (or Equivalent) per Head per Day from 1 Sack.	Number of Tons at 8 oz. of Maize (or Equivalent) per Head per Day per 1,000 Sheep per Month.
Roughages—					
Wheaten chaff	15½	50	45	52	13
Lucerne chaff	15½	80	28	77	13
Grains—					
Whole maize	8	160	14	320	6·6
Crushed maize	8	120	19	240	6·6
Wheat	8	175	13	350	6·6
Grain sorghum	8	156	14	312	6·6
Oats	10	130	17	208	8·5
Manufacturers' By-products —					
*Meatmeal	9	160	14	285	7·5
Nuts	9½	125	18	210	8·0
†Linseed oil meal ..	8	120	19	..	..
†Cottonseed meal ..	8	150	15	..	..

* Doubtful if sheep would eat sufficient for complete maintenance.

† Inadvisable to attempt to maintain sheep fully on these feeds.

From this table it is seen that less of the grains or meals is required to maintain 1,000 sheep for a month than is needed when feeding the bulky foods such as chaff and hay.

The relationship between the bulk and the feeding value of the various foodstuffs is important, as it influences such things as ease of handling, storage, road transport and rail freight.

These facts have important practical application and Tables 4, 5, and 6 have been drawn up to enable a comparison to be made of the purchase price and costs of freight and handling charges for different foodstuffs required to provide 1,000 dry sheep with 8 oz. of maize per head per day (or its equivalent) for a 30-day month, at varying market rates and for different distances of haulage.

From a study of these tables it is seen that it is usually far cheaper to feed sheep on concentrates, such as grain, than on roughage such as lucerne or cereal hay.

Suppose maize can be purchased at £20 per ton and lucerne at £10 per ton. The actual purchase price of the food required to maintain 1,000 sheep for one month on maize or lucerne would be £132 (see Table 4).

TABLE 4.

COMPARATIVE MAINTENANCE COSTS PER 1,000 SHEEP PER 30-DAY MONTH FOR VARYING COSTS OF FEED.
(Each sheep given the equivalent of 8 oz. of Maize per day.)

Foodstuff.	Tons per 1,000 per Month.	Purchase Price per Ton.									
		£1.	£2.	£3.	£4.	£5.	£6.	£7.	£8.	£9.	£10.
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Grain—											
Maize	6·6	6 12 0	13 4 0	19 16 0	26 8 0	33 0 0	39 12 0	46 4 0	52 16 0	59 8 0	66 0 0
Wheat	6·6	6 12 0	6 12 0	19 16 0	26 8 0	33 0 0	39 12 0	46 4 0	52 16 0	59 8 0	66 0 0
Grain Sorghum ..	6·6	6 12 0	6 12 0	19 16 0	26 8 0	33 0 0	39 12 0	46 4 0	52 16 0	59 8 0	66 0 0
Oats	8·5	8 10 0	17 0 0	25 10 0	34 0 0	42 10 0	51 0 0	59 10 0	68 0 0	76 10 0	85 0 0
Manufacturers' By-products—											
Meatmeal ..	7·5	7 10 0	15 0 0	22 10 0	30 0 0	37 10 0	45 0 0	52 10 0	60 0 0	67 10 0	75 0 0
Nuts	8·0	8 0 0	16 0 0	24 0 0	32 0 0	40 0 0	48 0 0	56 0 0	64 0 0	72 0 0	80 0 0
Roughages—											
Lucerne Chaff ..	13	13 0 0	26 0 0	39 0 0	52 0 0	65 0 0	78 0 0	91 0 0	104 0 0	117 0 0	132 0 0
Cereal Chaff ..	13	13 0 0	26 0 0	39 0 0	52 0 0	65 0 0	78 0 0	91 0 0	104 0 0	117 0 0	132 0 0

TABLE 5.

COMPARITIVE RAIL FREIGHTS FOR MAINTENANCE OF 1,000 SHEEP PER MONTH ON DIFFERENT FEEDS CARRIED VARYING DISTANCES.

Feed.	Tons per 1,000 per Month.	Rail Freight per Ton—Rebate Rates.															
		10s.			£1.			£2.			£3.			£4.			£5.	
		£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
Grains—																			
Maize ..	6·6	3	6	0	6	12	0	13	4	0	19	16	0	26	8	0	33	0	0
Wheat ..	6·6	3	6	0	6	12	0	13	4	0	19	16	0	26	8	0	33	0	0
Grain sorghum	6·6	3	6	0	6	12	0	13	4	0	19	16	0	26	8	0	33	0	0
Oats ..	8·5	4	5	0	8	10	0	17	0	0	25	0	0	34	0	0	42	0	0
Manufacturers' By-products—																			
Meatmeal	7·5	3	15	0	7	10	0	15	0	0	22	10	0	30	0	0	37	0	0
Nuts ..	8·0	4	0	0	8	0	0	16	0	0	24	0	0	32	0	0	40	0	0
Roughages—																			
Lucerne chaff ..	13	6	0	0	13	0	0	26	0	0	39	0	0	52	0	0	78	0	0
Cereal chaff ..	13	6	10	0	13	0	0	26	0	0	39	0	0	52	0	0	78	0	0

TABLE 6.

ROAD FREIGHT AT 1S. PER TON-MILE FOR VARIOUS FEEDS REQUIRED TO MAINTAIN 1,000 DRY SHEEP PER MONTH (30 DAYS) FOR DIFFERENT DISTANCES.

Feed.	Tons per 1,000 per Month.	Miles Carted.															
		10.			20.			30.			40.			50.			
		£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	
Grains—																	
Maize ..	6·6	3	6	0	6	12	0	9	18	0	13	4	0	17	10	0	
Wheat ..	6·6	3	6	0	6	12	0	9	18	0	13	4	0	17	10	0	
Grain sorghum	6·6	3	6	0	6	12	0	9	18	0	13	4	0	17	10	0	
Oats	8·5	4	5	0	8	10	0	12	15	0	17	0	0	21	5	0	
Manufacturers' By-products—																	
Meatmeal ..	7·5	3	15	0	7	10	0	11	5	0	15	0	0	18	15	0	
Nuts	8·0	4	0	0	8	0	0	12	0	0	16	0	0	20	0	0	
Roughages—																	
Lucerne chaff	13	6	10	0	13	0	0	19	10	0	26	0	0	32	10	0	
Cereal chaff ..	13	6	10	0	13	0	0	19	10	0	26	0	0	32	10	0	

However, if the rail freight at drought rebate rates is £3 per ton on the feed and if it has to be carted 20 miles from the rail head, the handling charges will be approximately as follows:—

	£	s.	d.
Maize:			
Rail freight—6·6 tons at £3 per ton ..	19	16	0
Road haulage—6·6 tons at £1 per ton ..	6	12	0
	26	8	0
Chaff:			
Rail freight—13 tons at £3 per ton ..	39	0	0
Road haulage—13 tons at £1 per ton ..	13	0	0
	52	0	0

Although the purchase prices are the same, the handling charges on the chaff are double those on the grain, and this represents quite an important expense.

The prices taken in the example are not exactly comparable for drought purposes, because there is seldom such a difference in favour of lucerne. Supposing good quality hay could have been bought at £18 per ton, the monthly cost of feeding it to 1,000 dry sheep at a rate equivalent to 8 oz. of maize per head per day would have been £234. Maize, wheat, and grain sorghum would have to be almost £40 per ton before they would cost as much.

The main success in buying drought feeds depends upon following the changes in the market. The 1948 drought gave several good examples of this. Early in 1948 grain sorghum was available at about £9 per ton (Brisbane) and this was the cheapest feed to buy. Subsequently, the price of sorghum rose steeply, but maize was available at about £14 per ton (Brisbane). When its price was decontrolled it rose rapidly but feed wheat became available at £9 10s. per ton (Brisbane). During the whole of this period lucerne was quoted at from £14 to £18 per ton. In these circumstances the most economical way of feeding sheep was to purchase grain sorghum initially, then maize, and finally wheat when the price of maize rose. By doing this one woolgrower fed sheep at less than half the cost incurred by other men in the same district who fed full rations of lucerne continuously.

This raises the question of the necessity of feeding roughage to drought-stricken sheep. It has been found that roughage is not necessary for the well-being of adult sheep, but is required for young animals, and field experience under drought conditions confirms this observation.

On the other hand, most men like to give their sheep some roughage, and a mixture in the ration is of value because sheep which do not eat one feed well will often eat another and by feeding a small amount of good quality roughage with grain, losses can be minimised. One of the most economical and successful rations fed during the 1948 drought consisted of 8 oz. of crushed grain plus 2 oz. of lucerne per head per day. This was equivalent to about 9 oz. of grain per head per day.

THE SUITABILITY OF FOODSTUFFS.

Another important point to consider in purchasing feed is its suitability for drought feeding. The main points to consider in this connection may be summarised as follows:—

Grains.

Maize.

Maize is very rich in starch and this strengthens weak sheep quickly. The grain has comparatively little protein and accordingly it should be supplemented with some protein-rich meal. Maize is rich in vitamin A, but like other cereal grains is poor in lime. It is easy to feed, as it can be broadcast on the ground. However, it is preferable to feed it in troughs and this is essential when it is cracked and/or a concentrated meal is added to the ration.

Wheat.

Wheat is not so popular in Queensland as maize, though it has about the same feeding value. Like maize, it has not a high protein content and accordingly it is preferable to add some protein-rich supplement such as meatmeal, cottonseed meal or linseed oil meal to the ration. Wheat is not rich in vitamin A or lime. It should be rolled and trough fed, and the quantity controlled because of the possibility of over-engorgement.

Grain Sorghum.

Grain sorghum is a useful drought food with a feeding value close to that of maize. It is not rich in vitamin A and has a low lime content. The supply is usually good and in the past it has been one of the cheapest feeds when considered in the light of its high food value. Grain sorghum is extremely hard and must be crushed and fed in troughs. It is necessary to control the daily intake.

Oats.

Oats, though a good feed, are not used extensively. The main reasons for their apparent lack of popularity are high price and short supply. Their feeding value is not as high as that of the other grains, but they contain more fibre; this satisfies hungry sheep and tends to stop them from wandering; in addition it makes the grain extremely useful for young sheep. They are not rich in minerals. Oats must be trough fed. When available, they can be used instead of lucerne and maize together.

Manufacturers' By-products.

Cottonseed Meal.

Cottonseed meal is very rich in protein and high in over-all drought food value. It is quite palatable and has an added advantage in that it colours the muzzle of sheep which eat and non-eaters can thus be detected readily. It is extremely useful to add to hay or grain rations as a protein-rich supplement, in which case the daily rate of feeding should not exceed 4 oz. per head. It is unsuitable for a complete maintenance feed for lengthy periods by itself. Cottonseed meal must be trough fed.

Linseed Oil Meal.

Linseed oil meal is relished by sheep and is well known as a "good woolgrowing feed." As a drought food linseed has about the same value as maize, but it is richer in protein. It is unsuitable as a complete maintenance ration and if fed at more than 4 oz. per head per day it may cause scouring. It is most useful as a source of protein to supplement a cereal grain or hay ration. Linseed oil meal must be trough fed.

Meatmeal.

Meatmeal is a useful source of protein and its feeding value is high. It is usually reasonably cheap, but it is not particularly palatable. Accordingly, it can be used most effectively as a protein-rich supplement fed with cereal grains or chaff or hay. Naturally, meatmeal must be trough fed and should be mixed with some palatable food.

Bonemeal.

Several brands of sterilized bonemeal are on the market and are useful in augmenting the scanty mineral content of the cereal grains. About 1 per cent. of finely ground bonemeal should be added to all rations consisting mainly of cereal grains. Lime may also be used provided it is finely ground and is free from such contaminants as lead and arsenic.

Nuts.

Several brands of nuts made from various by-products and crushed grains are marketed and they usually have a fairly high food value—somewhere between maize and oats, depending on the brand. Nuts can be broadcast on the ground but care must be taken to see that the sheep do not go "nut happy" and chase after the truck from which they are distributed.

Roughages.

Lucerne.

Lucerne is available as hay or chaff. The former is probably the easier to feed. Lucerne has quite fair food value. It is rich in protein, in minerals, and, if it has not been stored long, in vitamin A. It also contains ample fibre and is therefore useful for young sheep, but the cost, freight and handling charges are often excessive.

Cereal Hay or Chaff (Oaten or Wheaten).

It is wasteful to feed cereal hay, as a lot of grain is lost, and chaff is of doubtful value for young sheep for roughage as it tends to blow away. The feeding values of oaten and wheaten chaff are comparable, but because of high freight and handling charges cost may be a disadvantage.

THE PRACTICE OF FEEDING.

In undertaking hand feeding of sheep in drought time several initial decisions must be made. These are:—

(i) When should feeding commence?

(ii) How much feed should be given to the sheep?

(iii) How should the feed be offered?

(iv) Which sheep should be fed and how should the flock be managed generally?

Commencing to Feed.

The decision as to the time of commencing feeding depends largely upon the location of the property. Generally speaking, graziers in the northern and central part of the State would be well advised not to commence feeding as soon as it becomes obvious that the summer rains have failed. In those areas the chances of relief from winter rains are remote and, unless there are particular circumstances—such as lambing ewes or special blood lines which it is desirable to preserve—complete hand feeding cannot be recommended before the late winter or early spring. By that time there are three chances in four that the drought will break within six months. On the other hand, it is not advisable to let the sheep get too weak before commencing to feed.

Should summer rains fail, it is possible in the majority of cases to get a fairly definite indication from the condition of the sheep, their history (that is, whether they have been joined or not, age, &c.), the state of the pasture, the amount of top feed and the water supplies, as to the chances of the flock battling through to the next most likely rain period. Should there be no chance of the majority of animals getting through it is better to take immediate action to reduce numbers and seek agistment. If, on the other hand, there seems some chance of the flock being able to pull through, though it is realised feeding may have to be practised, it is better to commence feeding fairly early in order to preserve and strengthen the condition of the sheep. In addition at this time food costs are usually lower.

From the point of view of sheep feeding a drought might be broken into three stages:—

(1) The period when the sheep enter the drought and commence to fall gradually in condition. In this stage they may slip to below forward store condition but they should not be allowed to go past good strong store condition. At this stage, there is usually some roughage available but it may be of comparatively low nutritive value.

(2) In the second stage if they are not fed the sheep slip from good strong store condition to one approaching weakness. By this time the pasture is falling off very rapidly in quantity and quality.

(3) The third stage is when the sheep are definitely weak and deaths are likely. At this stage grass is virtually non-existent.

Feeding should commence in the first stage and the initial ration might be regarded as a supplement. It could consist of salt, finely ground limestone and a meal such as meatmeal, linseed meal, cottonseed meal, and/or crushed grain sorghum or maize meal mixed in the proportions of 30, 35 and 35. The mixture can be bound with a little dilute molasses and can be fed from troughs at the rate of 1 to 2 oz. per head per day depending on the class of sheep being fed. The object of this supplement is to prevent the sheep from becoming weak through drawing on their body stores, and to accustom them to a procedure which may become continuous.

As the pasture deteriorates and the second stage is approached it becomes necessary to increase the amount of nutriment offered to the sheep. The quantity of salt and limestone can be decreased and the proportion of meal increased and it may be necessary to feed more than 2 oz. per head per day.

How Much Feed is Required.

As the position deteriorates the amount of feed must be increased. Table 7 shows the quantities which must be given to adult dry ewes during the various stages of drought. In interpreting the table, it is as well to remember that the owner should be the best judge of the condition of his sheep and he should vary their ration as required.

TABLE 7.

AMOUNTS OF FEED REQUIRED BY ADULT DRY EWES AT VARIOUS STAGES.

Feed.	Entering Drought.		Some Roughage Available.		Practically no Roughage.	
	Ounces per Sheep per Day.	Bags per 1,000 Sheep per Day.	Ounces per Sheep per Day.	Bags per 1,000 Sheep per Day.	Ounces per Sheep per Day.	Bags per 1,000 Sheep per Day.
Grains—						
Maize ..	3·0	1·15	6·0	2·3	9·0	3·5
Wheat ..	3·0	1·05	6·0	2·1	9·0	3·2
Grain Sorghum	3·0	1·20	6·0	2·4	9·0	3·6
Oats ..	4·0	2·0	8·0	4·0	12·0	6·0
Manufacturers' By-products—						
Nuts ..	3·75	2·0	7·5	4·0	11·25	6·0
Roughages—						
Cereal Chaff	No real need to feed roughages during these stages.				17·5	13·5
Lucerne Hay					20·0	20·5

Naturally, the total ration must be modified according to age and class of the sheep and the various foodstuffs used.

If the sheep are in reasonable condition when feeding commences it does not matter very much if they do lose weight gradually. In fact, it is most economical to let them do so, provided they do not become weak. Actually, when the sheep are losing weight they are living partly on their own tissues; it is interesting to note that every 1 lb. of body tissues used in this way provides an amount of energy almost equivalent to that obtained from feeding 4 lb. of maize.

TABLE 8.

AMOUNTS OF FOOD FOR VARIOUS CLASSES OF SHEEP.

Class of Sheep.	Oz. of Maize (or equivalent) per Head per Day.
Ewes (within 2 months of lambing)	12
Dry Ewes	9
Ewe Weaners (under 7 months)	4 + protein and roughage

In some field trials conducted in Queensland in 1936 a group of sheep averaging 70 lb. liveweight were fed for 14 weeks on 5½ oz. of wheat plus 2½ oz. of nuts per head per day. Their average weight fell by 7 lb. to 63 lb. per head and the ration was about equivalent to 7½ oz. of maize. Nine ounces of maize per head per day would have probably maintained the sheep at about 70 lb. liveweight, but this would have taken approximately an additional 1¼ tons of maize per 1,000 sheep per month. Allowing the sheep to lose 7 lb. liveweight was not very serious from the point of view of the well-being of the flock, but the cash saving was rather important.

Table 8 indicates the proportions which might be given to the various classes of sheep, expressed in ounces of maize per head per day.

Suppose it is desired to feed dry ewes, and maize and lucerne hay are available at reasonable prices. A ration of 8 oz. of maize plus 2 oz. of lucerne per head per day is equivalent to 9 oz. of maize per head per day, as the feeding value of lucerne is only about half that of maize. This necessitates substituting 2 oz. of lucerne for 1 oz. of maize.

Likewise, because of their different feeding values, about 8 oz. of lucerne plus 5½ oz. of nuts per head per day are equivalent to 9 oz. of maize per head per day. Comparable rations can be calculated from the information on the number of drought food units per 100 lb. of foodstuff in Table 2. Table 9 gives the weight of the various foodstuffs which might be substituted for varying quantities of maize.

TABLE 9.

WEIGHTS OF VARIOUS FOODSTUFFS EQUIVALENT TO VARIOUS AMOUNTS OF MAIZE.

Grains—	Ounces.								
Maize	1·0	2·0	3·0	4·0	5·0	6·0	7·0	8·0	9·0
Wheat	1·0	2·0	3·0	4·0	5·0	6·0	7·0	8·0	9·0
Grain Sorghum ..	1·0	2·0	3·0	4·0	5·0	6·0	7·0	8·0	9·0
Oats	1·3	2·6	4·0	5·3	6·6	8·0	9·3	10·6	12·0
Manufacturers' By-products									
Nuts	1·25	2·5	3·75	5·0	6·25	7·5	8·75	10.0	11·25
Meatmeal ..	1·0	2·0	3·0	4·0	} Inadvisable to feed beyond this level.				
Linseed Meal ..	1·0	2·0	3·0	4·0					
Cottonseed Meal..	1·0	2·0	3·0	4·0					
Roughages—									
Cereal Chaff or Hay	2·0	4·0	6·0	8·0	10·0	12·0	14·0	16·0	18·0
Lucerne Chaff or Hay	2·0	4·0	6·0	8·0	10·0	12·0	14·0	16·0	18·0

From this table it is readily seen that about 4 oz. of lucerne hay plus about 8½ oz. of nuts are equivalent in feeding value to 9 oz. of maize. Similarly 6½ oz. of oats plus about 5 oz. of nuts are approximately equal in feeding value to 9 oz. of maize.

Some Special Requirements in Drought Feeding.

Special attention should be given to young sheep, to ewes heavy in lamb and to rams. If lambs are being fed it is essential to give them roughage to develop their paunch (or first stomach) and to teach them to chew their cud. Growth is essentially a period of protein storage and for this reason adequate protein must be included in the ration. If roughage has to be purchased for the young sheep, lucerne is most suitable because it contains adequate protein, minerals and vitamin A, so necessary for young animals.

Although it may be expensive it is better to feed the lambs and weaners well, as they constitute one of the most important parts of the flock and a check in growth during their early life may decrease their earning capacity forever. A ration consisting of 4 oz. of maize and 8 oz. of lucerne per head per day would be adequate in energy content for young sheep but may not contain enough protein and it would be preferable to decrease the maize a little and substitute a protein-rich meal, such as cottonseed or linseed meal.

Pregnant ewes require additional food to provide for the lambs they are carrying. Three ounces of maize per head per day or its equivalent, in addition to the maintenance ration, should be sufficient if it is fed during the last two months of pregnancy. Extra protein may be included in the ration at this time to stimulate the milk supply. This would only be done if it was desired to save the lambs.

Rams require special attention because they are often put to work as soon as the drought breaks. It has been conclusively shown that rams which have been subjected to long periods of vitamin A deficiency, as occurs during drought time, may become comparatively infertile. In addition, sufficient protein is required to permit normal sperm formation. Accordingly, it is as well to feed rams a ration rich in protein and vitamin A. Several ram meals designed to meet these requirements are available, but, if it is desired to feed the rams from the store of food on hand, it is advisable to give them lucerne, maize and a protein-rich meal in the proportions of 8 : 8 : 4 ounces per head per day.

One other special requirement for which there is not often a demand in Queensland, but which is important nevertheless, is the additional fibrous food needed during cold weather. The fibre in most foodstuffs is utilized for heat production and during cold weather it is advisable to feed increasing quantities of roughage to assist the sheep in "keeping themselves warm."

As the cereals are notoriously deficient in minerals, it is always necessary to include 1 per cent. of finely ground limestone in a drought ration composed entirely or almost entirely of these grains.

[TO BE CONTINUED.]

Care of Mother and Child.

THE CRYING BABY.

GENERALLY when a baby cries it is a sign that he is uncomfortable and he wants help. He might be hungry; he might be thirsty; he might have a distended stomach from overfeeding; he might want his soiled napkin changed, or his crumpled sheets straightened out. He might want an irritating safety pin moved. He might be too hot or too cold. All these physical causes can easily be remedied.

But what of the psychological or emotional causes? Few people realise that a baby is born with psychological attributes and these are no less important or prominent that his physical attributes. No two babies are alike in their make up, their needs or their demands, and consequently their care and training need to be particularised. The emotions of the infant begin to unfold early and his habits alter as he grows older. He has his good days and his bad days. Sometimes nothing will satisfy him and these moods are put down to teething, which is incorrect.

Repeated yielding by parents often makes a tyrant out of a child and the older he grows the worse this selfish attitude becomes. Unless checked before this disposition becomes a part of their personality, many of these children grow up bullies or day dreamers and reach maturity as misfits.

The following rules properly applied will, by preventing the baby from getting into the habit of crying, save mothers coming home from hospital a lot of unnecessary worry:—

1. Have your baby examined by a competent physician. If he tells you that baby is all right, believe him.
2. A good lusty cry for a few minutes does no harm. It is an indication of good health.
3. When baby begins to cry, try to make him comfortable. If it is not near his feed time, offer him a bottle of warm water. If it is close to feeding time and he is still crying, feed him. Some children will choose a three-hour, others a four-hour feeding time, but whatever is chosen a certain amount of elasticity must be allowed. Be guided by the baby and not by the clock.
4. If after emptying the bottle he goes to sleep you can assume that he was hungry, and if this continues several times during the day you can be sure that he needs more food.

   If a breast-fed baby cries two hours after he is fed, and on being fed again goes to sleep and repeats this performance he is just telling you that he is not getting enough to satisfy him for three or four hours.

   But if an infant cries before, during, and after feeding, putting more food in his stomach will not help him. This type of crying should be investigated to exclude any physical upset.
5. The babe might be one of those sensitive infants who require some medicine to calm them.

6. If your babe is one of those who demand extra attention, treat him with tolerance and understanding. Let him cry it out. It is far better to do this a few times, when the infant will learn that it is waste of time, than to give in, and spend months of misery with a tyrannical child.

USE COMMON SENSE IN FEEDING BABY.

In spite of criticism of the "modern mother" it can safely be said that the mother—and father too—of 1949 who have looked forward to the arrival of their new baby and loved it from the moment they saw it are just as keen to do their very best for it as the parents of previous generations. We must admit that they have greater opportunities for extending their knowledge of child care—Child Welfare Centres, Kindergartens, the Press, the radio, and booklets and pamphlets all offer to parents the results of the experience of medical child specialists, nurses and kindergarteners who have worked for many years in the field of infant and child welfare.

Mothers and fathers undoubtedly need instruction and guidance in the bringing-up of their children.

Our knowledge that the foundations of a child's mental, physical, and emotional health are laid for good or ill in the first five years of life adds emphasis to this statement. The relatively small size of the present day family will result in generations of young mothers who have no personal knowledge of babies in their own homes and may never have handled an infant before their own first babies arrive.

How terrifying this predicament can be, no one but these mothers themselves can realise.

So a guide must be found.

If the guide is a person experienced in the ways of babies and wise in giving of that experience all will be well, because he or she will encourage the mother to make her own observations about her own particular baby and act on them when it seems the sensible thing to do.

But mother may choose for her guide one of the numerous baby books which says that babies must be fed regularly three- or four-hourly and that this and that are procedures to be followed. Instead of using this book as the guide it was meant to be, the harassed, inexperienced young mother may persist in regarding it as infallible and then trouble may arise.

We can affirm at this stage that the majority of babies do well on a three- or four-hourly feeding interval. In fact, as a result of an experiment carried out in 1947 on 100 American babies it was found that, *left to themselves*, all these babies with one exception established a regular two-, three-, or four-hourly feeding rhythm by 1 month of age and by 3 months had "put themselves" on to four-hourly feedings.

Grandmother did not feed her baby "by the clock," but with her generally much larger family and with fewer conveniences in her home she would not be likely to feed her baby oftener than the three- or four-hourly interval which he no doubt established for himself.

However, even with this in mind a mother must use common sense in the feeding of her own baby. If he leaves hospital on a four-hourly feeding and persistently wakes and seems hungry at three and a-half hours she should feed him then and not struggle for another half hour with a screaming, ravenous baby who will doubtless when the routine feeding time comes "gobble" his food and have wind and indigestion as a result.

The very sleepy baby who goes to sleep at the breast and therefore takes an insufficient amount of food per day needs to be fed when he is wide awake and hungry, regardless of his regular schedule.

The difficult baby who fights or refuses to suck should be fed when he is quiet and peaceful and mother thinks he might feed, even though he is not "due" for another hour.

Books on infant welfare by acknowledged authorities can be and are a tremendous help to parents, but mothers must remember that each baby is an individual and no book could ever entirely take the place of the personal observations of the intelligent, loving mother on her own particular baby as she grows in her own knowledge and experience of him.

If you have any problem in connection with this or other matters connected with children, advice may be obtained by communicating personally with the Maternal and Child Welfare Information Bureau, 184 St. Paul's Terrace, Brisbane, or by addressing letters "Baby Clinic, Brisbane." These letters need not be stamped.

ASTRONOMICAL DATA FOR QUEENSLAND.

JUNE.

By W. J. NEWELL, Hon. Secretary of The Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Day.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	6.30	5.00	Cairns	8	50	Longreach	26	43
6	6.32	5.00	Charleville ..	24	30	Quilpie	37	33
11	6.34	4.59	Cloncurry	36	63	Rockhampton ..	0	19
16	6.36	5.00	Cunnamulla ..	32	27	Roma	15	19
21	6.38	5.00	Dirranbandi ..	22	16	Townsville ..	8	42
26	6.39	5.02	Emerald	11	28	Winton	29	52
30	6.39	5.03	Hughenden ..	21	49	Warwick	5	3

TIMES OF MOONRISE AND MOONSET.

At Brisbane.		
Day.	Rise.	Set.
	a.m.	p.m.
1	10.21	8.54
2	11.06	9.59
3	11.46	11.04
	p.m.	
4	12.22	..
		a.m.
5	12.56	12.08
6	1.29	1.11
7	2.04	2.15
8	2.41	3.21
9	3.23	4.28
10	4.11	5.37
11	5.06	6.45
12	6.05	7.48
13	7.07	8.45
14	8.09	9.33
15	9.08	10.14
16	10.05	10.50
17	10.59	11.21
18	11.51	11.49
		p.m.
19	..	12.16
	a.m.	
20	12.42	12·43
21	1.34	1.12
22	2.28	1.42
23	3.24	2.16
24	4.23	2.57
25	5.23	3.44
26	6.24	4.38
27	7.23	5.39
28	8.16	6.45
29	9.04	7.51
30	9.46	8.57

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27 ; Cunnamulla 29 ; Dirranbandi 19 ;
Quilpie 35 ; Roma 17 ; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Day.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	10	29	26	44	0	19	28	52
6	20	19	36	35	11	10	42	40
11	30	9	46	24	21	0	54	26
16	24	13	41	29	16	3	47	32
21	15	23	31	39	7	14	35	45
26	9	30	25	45	0	21	26	54
30	13	25	28	41	3	16	31	47

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	6	51	35	64	20	50	6	43
3	15	40	40	58	25	43	14	34
5	27	35	48	55	33	40	22	30
7	38	23	56	45	41	30	32	20
9	50	10	64	37	48	23	41	10
11	56	3	68	32	52	18	46	4
13	54	3	67	32	51	18	44	4
15	46	9	62	36	47	22	38	9
17	37	19	55	43	40	28	31	17
19	27	29	48	50	33	35	22	25
21	21	38	44	57	29	42	18	33
23	12	48	38	62	23	48	11	40
25	5	55	35	67	19	52	5	45
27	2	55	33	67	17	52	3	45
29	8	48	36	62	21	48	8	40
30	13	42	39	59	24	44	12	36

Phases of the Moon.—First Quarter, June 4th, 1.27 p.m.; Full Moon, June 11th, 7.45 a.m.; Last Quarter, June 18th, 10.29 p.m.; New Moon, June 26th, 8.02 p.m.

On June 22nd at 4.03 a.m. Eastern Australian Standard Time, the Sun will reach its maximum angle north of the equator and will then shine directly over the tropic of Cancer and from Queensland generally will rise and set 25 degrees north of true east and true west respectively.

On the 6th and 27th the Moon will rise and set almost at true east and true west respectively.

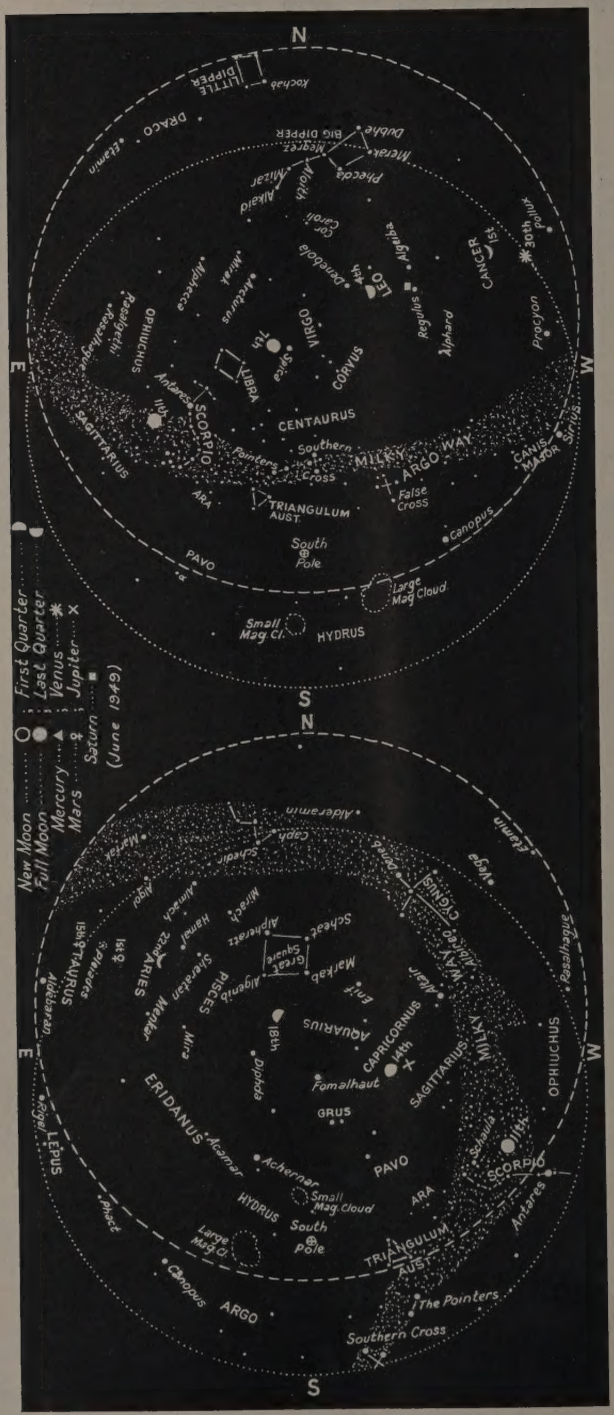
Mercury.—At the beginning of the month will be an evening object setting soon after sunset and will be in line with the Sun on the 3rd after which it will become a morning object reaching greatest angle west of the Sun on the 28th and rising 1¾ hours before the Sun by the 30th.

Venus.—Now an evening "star" visible low in the west during evening twilight. At the beginning of June, in the constellation of Taurus, will set 45 minutes after the Sun and at the end of the month will set 1½ hours after the Sun.

Mars.—In the constellation of Taurus, at the beginning of the month will rise 1 hour 15 minutes before the Sun and at the end of the month, 1¾ hours before the Sun.

Jupiter.—Now an interesting object in the constellation of Capricorn, in the eastern evening sky. At the beginning of June it will rise between 8.30 p.m. and 9.45 p.m., and at the end of the month between 6.30 p.m. and 7.45 p.m.

Saturn.—Now seen in the western evening sky, setting between 11 p.m. and midnight on the 1st and between 9 p.m. and 10.15 p.m. on the 30th.



Star Charts.—The chart on the right is for 7.15 p.m. in the south-east corner of Queensland to 8.15 p.m. along the Northern Territory border on the 15th June. (For every degree of longitude we go west, the time increases by 4 minutes.) The chart on the left is for 10 hours later. On each chart the dashed circle represents the horizon as viewed from Cape York and the dotted circle the horizon for places along the New South Wales border. When facing north hold "N" at the bottom; when facing south hold "S" at the bottom and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars which do not change their relation to one another, moving east to west, arrive at any selected position about 4 minutes earlier each night. Thus, at the beginning of the month the stars will be in the positions shown about 1 hour later than the time stated for the 15th and at the end of the month about 1 hour earlier than that time. The positions of the moon and planets, which are continually changing in relation to the stars, are shown for certain marked days. When no date is marked the position is for the middle of the month.